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Comment

Libya's uncivil air war

Back in 1989, when Colonel Muammar Gaddafi still ruled Libya with an iron fist, I flew into Tripoli airport. In those days, because of his support for terrorist groups around the world, and the US bombing of Tripoli in April 1986, you couldn't fly direct from London to Libya, so I had a 19-hour stop-over in Belgrade airport.

On the final approach to Tripoli airport, from my window seat, I could clearly see surface-to-air missile installations all around the airport and every few hundred yards along the periphery of the runway. Clearly the Colonel had no shortage of cash, which (I'm guessing) the Russians were happy to exchange for military hardware.

The Colonel's image was everywhere around the city and Libyan TV was pure propaganda, but the country did seem peaceful... at least on the surface.

Not so now. After Gaddafi's demise in 2011, Libya fell apart, with warlords and warring tribal factions all making land grabs. Almost a decade on it's no better, as Alan Warnes found out when he researched this month's Intel Report (page 30).

Now, Turkey has waded into this uncivil war, backing the optimistically-named Government of National Accord with troop transport and Bayraktar TB2 UASs; while Russia has pitched in on the Libyan National Army side with *Fencer* and *Fulcrum* aircraft.

It's complex, fascinating and depressing in equal measure, as this once-beautiful country and its people are torn apart. Don't miss Alan's excellent analysis.

The rest of this issue is equally riveting, as we look at different aspects of the German, Ukrainian, Israeli, Russian, British and South African air forces and much more besides.

Finally, when you get to page 50, we'd appreciate it if you could spend five minutes filling out our reader survey, which we hope will give us a clear view of where you want us to take the magazine in coming months. The survey is also available online at ***https://bit.ly/31G4N0J***

Many thanks. Enjoy the issue.

John Sootheran

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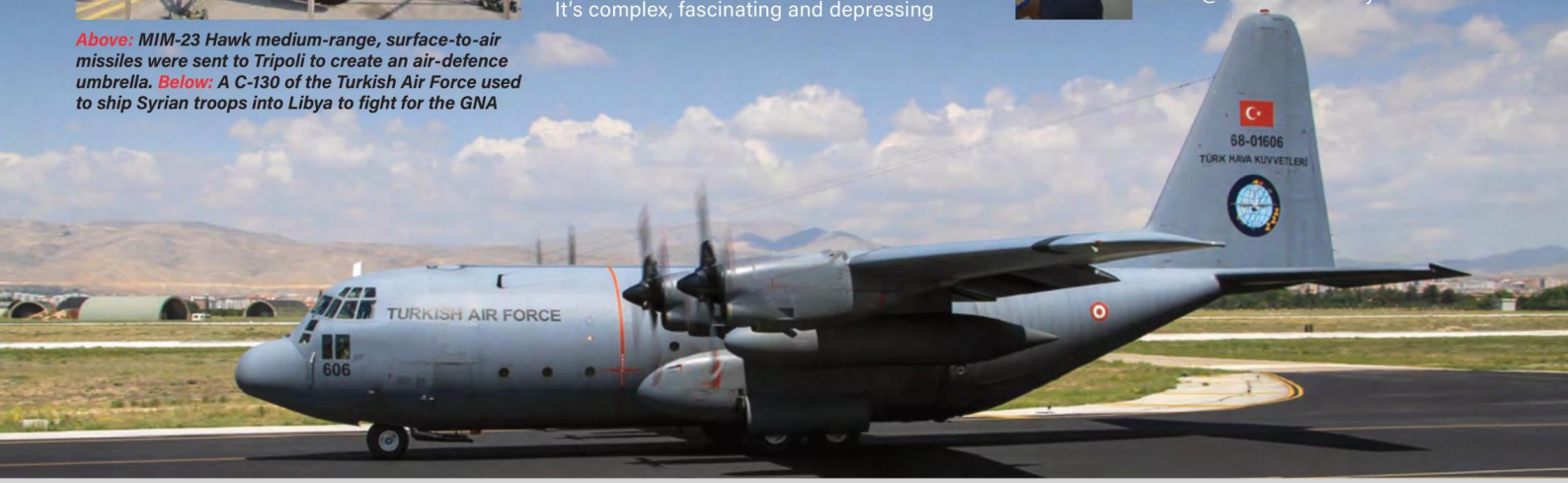
Above: ***MIM-23 Hawk medium-range, surface-to-air missiles were sent to Tripoli to create an air-defence umbrella.*** ***Below:*** ***A C-130 of the Turkish Air Force used to ship Syrian troops into Libya to fight for the GNA***



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***Cover:** A two-ship consisting of a Tornado IDS with RecceLite and a Tornado ECR with HARM missiles. Despite limited flight operations due to the coronavirus pandemic, training for new crews and combat missions has continued at TakItLwG 51 'I', based at Schleswig-Jagel* Stefan Petersen ***Below:** The Denel Rooivalk ('Red Hawk'), tail number 677, taking part in the South African National Defence Force's Armed Forces Day capability demonstration in Cape Town on February 21, 2019. It is equipped with two rocket pods and a 20mm nose cannon. The Rooivalk is operated by 16 Squadron located at AFB Bloemspruit, Free State province* Malcolm Reid

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Israel and Germany in historic first

Israeli Air Force aircraft have participated in German air combat exercises for the first time, a historic development for the two nations.

Six of the Israeli air arm's Lockheed Martin F-16C/D 'Barak' multi-role fighters, three from the 101st Squadron and three from the 105th, both based at Haztor in central Israel, took part over two weeks in August. The two exercises were Blue Wings 2020 during the first week and Multinational Air Group (MAG) Days in the second.

The six Fighting Falcons landed at Nörvenich air base in Germany on August 17. As part of the MAG Days exercise, the Barak fighters flew with and against other Nato member states' fighters and tankers, including Hungarian Air Force Saab JAS 39 Gripens.

"This is the first time that Israeli Air Force fighter jets have arrived in Germany. The exercise is unique in light of the historical aspects, but we are also looking to the future," said Lt Col Bassa, a German Air Force officer. "We plan to participate in the [Israeli AIr Force] Blue Flag exercise next year."

"This is the first time that Israeli Air Force fighter jets have arrived in Germany. The exercise is unique in light of the historical aspects, but we are also looking to the future," *Lt Col Bassa*

The Israeli F-16s also flew training missions with Luftwaffe Eurofighters from the Nörvenich-based Tactical Air Force Wing 31 'Boelcke'. This included dissimilar air combat training (DACT) and air-to-ground missions. A Gulfstream G550 'Nachshon Eitam' conformal airborne early warning (CAEW) aircraft from 122 Squadron also deployed to Nörvenich. The deployment was supported by Israeli-operated Boeing KC-707 and Lockheed KC-130H 'Karnaf' tanker/transports.

Lt Col A, commander of the 105th Squadron, said: "We will fly in a different environment than we are used to in Israel, with different flight platforms and flight rules."

The historic visit also included two joint German-Israeli fly-bys of the Dachau concentration camp and Fürstenfeldbruck Airport near Munich. The former was to honour the memory of the millions murdered during the Holocaust and the latter to commemorate the 11 Israeli athletes who were killed at the 1972 Munich Olympics.

The Israeli aircraft departed Germany on August 28.

$62bn overseas Falcon contract

LOCKHEED MARTIN was awarded a $62bn 10-year contract on August 14 for new production Lockheed Martin F-16 Fighting Falcons for foreign military sales to unspecified nations.

The $62bn is the upper limit for potential F-16 overseas customer orders over the next 10 years, not actual sales. The contract does include an initial delivery order for 90 aircraft, which are expected to be built by the end of 2026. Lockheed confirmed that 66 of those 90 are new F-16 Block 70 aircraft destined for Taiwan's Air Force.

A spokesperson for Lockheed said: "Taiwan and the [United States] signed a LOA [letter of offer and acceptance] valued at approximately $8bn in December 2019 for 66 new F-16 Block 70 aircraft for Taiwan's Air Force. These aircraft are part of the IDIQ contract award."

The State Department was unable to confirm If the remaining F-16s are for a foreign military sale to Morocco. Air Force Life Cycle Management Centre, Wright-Patterson Air Force Base, Ohio, is the contracting authority, but it declined to comment on the details.

UK-bound Lightning refuels

A US Marine Corps Lockheed Martin F-35B Lightning II from Marine Fighter Attack Squadron 211 (VMFA-211) 'Wake Island Avengers' conducts air-to-air refuelling from a New Jersey Air National Guard/141st Air Refueling Squadron KC-135R tanker en route from its base at Marine Corps Air Station (MCAS) Yuma, Arizona, to MCAS Beaufort, South Carolina, on August 31 as it begins its journey to the UK. The aircraft is one of ten VMFA-211 F-35Bs that were flown from Beaufort to RAF Marham, Norfolk, where they arrived on the evening of September 3, following a 24hr weather delay prior to departing the US. They will be training with the Royal Air Force's 617 Squadron in preparation for next year's historic arrival of VMFA-211 on the aircraft carrier HMS 'Queen Elizabeth' (R 08) in support of its inaugural global deployment *USAF/Major James Shaughnessy*

Boeing is contracted to deliver 24 next-generation MH-47G Block II Chinooks to US Army Special Operations *Boeing*

Boeing delivers first MH-47G Block II to US special ops command

US Special Operations Command (SOCOM) has taken delivery of its first MH-47G Block II Chinook, Boeing announced on September 1. The company has 23 more to deliver under a contract it signed with SOCOM in July. The next-generation aircraft has what Boeing calls the Advanced Chinook Rotor Blade, as well as redesigned fuel tanks, a strengthened fuselage, and an improved drivetrain. Boeing said it had also made other technological advancements that can extend the fleet's service life and enhance performance.

UK, Belgium agree drone deal

In the same week as Belgium announced its SkyGuardian contract, the UK and Belgium revealed on August 17 that they are exploring a collaboration on the General Atomics Aeronautical Systems MQ-9B SkyGuardian Remotely Piloted Aircraft System (RPAS). The two countries signed a bilateral statement of intent to collaborate on training, maintenance, logistics support and capability enhancement.

The MQ-9B has been designed to meet NATO's airworthiness type-certification standard, STANAG 4671, for its operation in civil airspace. It can perform border patrol, fire detection and firefighting support and resource monitoring missions. It also has a detect and avoid system for civil airspace operations and it is built for all-weather performance with lightning protection, a damage-tolerant airframe and a de-icing system.

The UK MQ-9B contract for three Protectors with an option for 13 more was announced in July (the UK refers to the SkyGuardian as the Protector RG Mk1) and the first of them is scheduled to be delievered in 2021. It differs from the SkyGuardian because it has X-band satellite communications and UK weapons. The first of four Belgian MQ-9Bs will be delivered in 2023.

"As the second Air Force acquiring this system, we are proud to join the United Kingdom in setting the first milestones towards interoperability between both our systems," Major General Frederik Vansina, Commander of the Belgian Air Component, said. "As other NATO Air Force's join the United Kingdom and Belgium in acquiring this cutting-edge capability... we will seamlessly integrate [it] into densely navigated airspaces around the globe."

The Belgium contract covers the design, development, integration and production of the RPAS, along with its sensor payloads. They include electro-optical and infra-red video, synthetic aperture radar and GMTI surveillance. The contract also encompasses ground control stations, ground support equipment and spare parts.

SkyGuardian was also selected by the Australian Defence Force under its Project Air 7003.

Watchkeeper flies for UK Border Force

The British Army has deployed the Watchkeeper unmanned aircraft system (UAS) "to support the UK Home Office" in monitoring migrant boats crossing the English Channel.

Built by Thales in the UK and operated by the 47th Regiment Royal Artillery, the UAS flew its first reconnaissance mission for the UK Border Force on August 29, taking off from Lydd Airport in Kent.

Announcing the flight on Twitter, a Ministry of Defence statement said: "We remain fully committed to support the UK Home Office as they tackle the increasing number of small boats crossing the English Channel."

Soldiers from 47th Regiment Royal Artillery conduct final checks on the Watchkeeper drone at Lydd Airport, Kent, on August 29, before it carries out its first reconnaissance flight for the UK Border Force
MoD Crown Copyright

Watchkeeper is equipped with radar and its infra-red, full-motion video cameras give it a visual range of up to 107 nautical miles, day or night. Other sensors include a ground movement target indicator (GMTI), used to identify targets on the ground.

The aircraft also has a laser target marker, designator, and range finder to paint targets for missile attack.

The Watchkeeper system has previously been deployed against the Taliban in Afghanistan in a force protection role. The aircraft has undergone flight testing in West Wales and is certified to operate safely in UK airspace.

Czech Air Force retires Yak-40s

The Czech Air Force's two Yak-40s perform their final flight before retirement at Kbely on September 2 *Czech Ministry of Defence*

The Czech Air Force held a farewell ceremony to mark the retirement of two of its Yak-40s after more than 20 years of service.

During the event at the 24th Air Force Base at Prague-Kbely Airport on September 2, the two aircraft, serial numbers 0260 and 1257 (the latter a Yak-40K variant), performed a formation flypast for Czech Ministry of Defence guests. These included Brig Gen Petr Lanči, Deputy Commander of the Czech Air Force, and Lubor Koudelka, the Czech Republic's Deputy Minister for Armaments and Acquisitions.

The former Czechoslovakia was one of the largest customers for the type. Seventeen were delivered to Czechoslovak Airlines, while a further eight joined the air division of the Ministry of the Interior, otherwise known as the Government Squadron.

In 1981, the decision was made to transfer two of the Ministry's Yak-40s to the Air Force and they joined what was then the 3rd Transport Air Regiment at Kbely.

After that, they were operated by the 241st Transport Squadron. Although primarily used for the transport of government officials, they were also used for general military transport and for medical evacuations.

Puma Phantom Flights to go to sea

Above: ***A seaman with 700X Naval Air Squadron launches a Puma UAS from a Royal Navy vessel*** *Royal Navy/LPhot Kyle Heller*

The 700X Naval Air Squadron's (NAS) Phantom Flights A, B and C's eight personnel are now ready to deploy unmanned aircraft systems (UAS) at sea, the Royal Navy announced on August 17.

Each Phantom Flight consists of a commander, an air engineering technician and a naval airman who each serve as remote pilots. Phantom Flights A, B and C are based at Royal Naval Air Station (RNAS) Culdrose in Cornwall and they will gain a ninth member later this year. The existing eight personnel have completed months of training on various UAS. The UAS that is being deployed on board Royal Navy ships is the hand-launched AeroVironment RQ-20 Puma, which can be flown directly from a vessel.

"It is great to be able to say that we have now completed the many months of training to take this remotely-piloted system to sea," 700X NAS commanding officer Lt Cdr Justin Matthews said. "We have two flights ready to deploy and a third to follow later in the year."

Although 700X NAS is based at RNAS Culdrose, it uses the less congested airspace at nearby RNAS Predannack for flight training with its UAS.

Earlier this year, on March 17, the Royal Navy announced that 700X NAS had successfully tested the Puma in the harsh conditions beyond the Arctic Circle for the first time.

Meanwhile, back at Culdrose, the unit's instructors had completed training of the 700th unmanned aircraft systems student.

Border Forces on Atlas' shoulders

RAF Brize Norton-based Airbus A400M Atlas were tasked in August – for the first time – with monitoring the English Channel for illegal boat crossings to help the UK Border Force.

The Atlas aircraft are providing surveillance and intelligence for the UK Coastguard and Border Force to help with the rapid interception of illegal boats.

The A400M at Brize Norton are operated by the 206, LXX and XXIV squadrons.

UK Defence Secretary Ben Wallace approved the use of a Royal Air Force A400M to support the Home Office and Border Force in their operations in the Channel on August 10.

This is the first time that a military aircraft has flown in support of the Border Force.

The Royal Navy previously offered assistance, most notably in January 2019.

The Ministry of Defence (MOD) has reported that use of this A400M is the MOD's "initial offer of support to the Home Office".

The defence ministry added that "further work is being carried out to determine who the MOD can further assist in the Channel".

RAF Shawbury commissions new wing

The Royal Navy's Fleet Air Arm has a new unit, 2nd Maritime Air Wing, which was commissioned at RAF Shawbury, Shropshire, on August 21 and will oversee pilot training.

The Wing will conduct training for the Airbus Helicopters H135 Juno HT1 and Airbus Helicopters H145 Jupiter HT1. The 2nd Maritime Air Wing will be required to produce 106 newly-trained pilots per year for the Fleet Air Arm, RAF and Army Air Corps. The wing has been operating since 2018, but had not been formally commissioned until now. The unit forms part of the Royal Air Force's 22 Training Group. It is one of two training wings that form No 1 Flying Training School, the other being 9 Regiment Army Air Corps.

"There is no doubt that the world-class training the wing delivers on behalf of Defence will ensure that the front line is supplied with well-trained and highly motivated rotary wing aviators," said Flying Training 22 Group assistant director, Capt Roger Wyness. "I am delighted that 2 Maritime Air Wing is undeniably 'Underway, Making Way'."

The training wings encompass 705 Naval Air Squadron, 660 Squadron AAC and 202 Squadron RAF. The unit traces its history back to the beginning of World War One. It was originally formed as the 2nd Squadron, Royal Naval Air Service, at Royal Naval Air Station Eastchurch on the Isle of Sheppey in Kent.

Successful Fleet Air Arm students will serve at Naval Air Squadrons 824, 825, 847 and 846. Of these, 824 Sqn flies the AgustaWestland AW101 Merlin HM2; 825 the AgustaWestland AW159 Wildcat HMA2; 846 the AgustaWestland AW101 Merlin HC4; and 847 the AgustaWestland AW159 Wildcat AH1.

First Poseidon sim lands in UK

Above: ***A CAE-made Boeing P-8A Poseidon MRA1 simulator arriving at Glasgow Prestwick Airport on board an Antonov An-124 in August*** *MoD Crown Copyright*

THE FIRST of two Boeing P-8A Poseidon MRA1 maritime patrol aircraft Operational Flight Trainer (OFT) simulators arrived at RAF Lossiemouth on August 18 after landing at Glasgow Prestwick Airport.

The Poseidon is a multi-role maritime patrol aircraft equipped with sensors and weapons systems for anti-submarine warfare, as well as surveillance and search and rescue missions.

The two OFT simulators are built by Québec-based simulator specialist CAE. An OFT is large at 7.39m long, 4m wide, 3.73m high and weighing 9,545.45kg. They are to be installed in a £100m facility built by Boeing Defence UK at RAF Lossiemouth. Part of a £470m investment in the air force base, two OFTs and two rear-crew simulators will also be installed there.

"The simulators provide training specifically for the pilots who will be flying the Poseidon fleet," said Mark Corden, the UK Ministry of Defence (Defence Equipment & Support) Poseidon delivery team training project manager. "They also have the compatibility to link up with the mission simulators used by the rear crew, allowing them to train together."

The Boeing facility will also house mission crew trainers, virtual maintenance trainers and electronic classrooms. By the end of this year, RAF Lossiemouth, located in Moray, northeast Scotland, will be the headquarters of the UK's Poseidon fleet of two squadrons. UK P-8As are flying from Kinloss Barracks airfield until the Lossiemouth facility and associated runway works are completed. Nine aircraft have been ordered with the ninth expected by the end of 2021. Since March, two Poseidon's have been flying from Kinloss Barracks. The remaining aircraft will arrive during 2020 and next year.

Fighters boost Finnish defence spend

Saab's new decoy missile system, the Lightweight Air-launched Decoy Missile, and the new Electronic Attack Jammer Pod, started flight test in 2019. Saab

A 54% leap in Finnish defence spending for 2021 to €4.87bn was announced on August 13 to fund the replacement of the Finnish Air Force's ageing Boeing F/A-18C/D Hornet fleet.

The Hornet fleet is to be replaced under the HX programme and five companies have submitted bids to provide Finland with a new fighter. The winner will be selected next year and in preparation the Finnish government wants a €1.7bn hike in 2021 defence spending.

The Ministry of Defence (MOD) explained that without the fighter procurement, the increase would have only been €50m to cater for issues, such as pay increases. The 54% boost pushes Finland's defence spending from 1.4% to more than 2% of the country's gross domestic product.

The MOD has outlined €10bn worth of funding to procure a sufficient number of multi-role fighters to replace its F/A-18C/D fleets, while maintaining and enhancing the air arm's combat capabilities.

In 2020, just €20m was allocated for the HX programme, which intends to replace the legacy Hornets between 2025 and 2030.

The fighters under consideration are: Dassault Rafale, Eurofighter, Saab JAS 39 Gripen E/F, Lockheed Martin F-35A Lightning II and the Boeing F/A-18E/F Super Hornet, however, the Boeing bid also includes its EA-18G Growler.

Boeing has offered the Growler to accommodate Finland's requirement for an electronic warfare (EW) capability. Likewise, Saab's Gripen E/F can offer new EW capabilities and its bid also includes another aircraft, the GlobalEye airborne early warning and control platform.

On August 28, Saab unveiled the new Gripen E EW capabilities, a lightweight air-launched decoy missile (LADM). The LADM is a stand-in jammer that can suppress enemy air defences.

Jonas Hjelm, senior vice president and head of Saab's aeronautics division, said: "The decoy missile will constitute a strong addition to [the] Gripen E/F's built-in electronic attack capabilities. The payload of the new decoy missile is to a large extent developed in Finland and this will strengthen our offer to Finland even further."

Romania builds F-16 fleet

TWO FORMER Portuguese Air Force Lockheed Martin F-16AM Fighting Falcons were delivered to the Romanian Air Force at Air Base 86 Borcea-Fetesti 'Lieutenant Aviator Gheorghe Mociornită,' Romania, on August 14.

The aircraft, serial numbers 1614 (ex-Portuguese Air Force 15132) and 1616 (ex-Portuguese Air Force 15135) had been handed over at Monte Real Air Base, Portugal, earlier that day before being flown to Fetesti. These are the first of five additional second-hand aircraft being acquired from Portugal. Two more are due to arrive in October, followed by the fifth aircraft in the first quarter of 2021.

The contract for these aircraft had been signed on January 27, 2020, by the Portuguese and Romanian ministers of defence. The deal included modification of the aircraft to Romanian specifications, transfer of technology and setting up a maintenance facility in Romania.

The country already has 15 F-16AM/BMs in its inventory, also acquired from Portugal, and delivered between September 2016 and September 2017. These comprise nine F-16AMs and three F-16BMs. All the F-16s are flown by the 53rd Fighter Squadron at Fetesti.

Newly acquired from the Portuguese Air Force, Romanian Air Force F-16AM serial number 1614 lands at Borcea-Fetesti on August 14 following its delivery flight from Monte Real, Portugal *Romanian MOD Adrian Sultanoiu*

Italian F-35As surpass 5,000 flight hours

The Italian Air Force announced that its Lockheed Martin F-35A Lightning II fleet – operated by the service's 32nd Wing – had passed the 5,000 flight hour milestone on August 12.

This milestone comes four years after Italy formally accepted its first F-35A and just two years since the air force declared initial operational capability on the type. Since 2018, Italian Lightnings have regularly conducted quick reaction alert and airspace surveillance missions. The platform has also deployed to Keflavik to support NATO's Icelandic Air Policing mission. Italian F-35As have also been present at international exercises, including Red Flag 20-2 in the US, and Blue Flag 2019 in Israel.

"Thanks to the teamwork and high skills of all the men and women of the Wing, it has been possible to achieve this result," Col Stefano Castelnuovo, commander of the 32nd Wing, said. "Which must be considered as a starting point towards more ambitious goals in the ongoing transformation of the armed forces."

Italy is seeking to procure 60 conventional take-off and landing F-35A Lightning IIs for the air force. The nation is also set to acquire 30 short take-off and vertical landing capable Lockheed Martin F-35B Lightning IIs, which will be split between the air arm and the navy.

According to *AirForces Intelligence* data, as of August 25, a total of 12 F-35As have been delivered to the Italian Air Force. The first F-35B emerged from the Cameri, Italy-based F-35 final assembly and check out facility in May 2017.

US Marines prepare for Queen Elizabeth

Maj Gen Stephen Neary (second from left) tours the flight deck of the HMS* Queen Elizabeth *in Portsmouth, England, August 27
US Marine Corps photo by Staff Sgt Brytani

The United States Marine Corps (USMC) Forces Europe and Africa commander, Maj Gen Stephen Neary, visited the Royal Navy's HMS *Queen Elizabeth* (QNLZ) aircraft carrier in Portsmouth, UK, on August 27.

Six Lockheed Martin F-35B Lightning II aircraft from the USMC Marine Fighter Attack Squadron 211 (VMFA-211) will fly from the *Queen Elizabeth* during its inaugural deployment in 2021. VMFA-211 will work alongside the UK's own F-35B 617 Squadron as Carrier Strike Group-21. The deployment of USMC F-35Bs aboard the QNLZ demonstrates that US and UK forces intend to be interoperable and integrated. During Neary's visit he met the carrier's leadership and toured the ship to increase his understanding of the US Marine Corps' future operations with the UK's carrier strike group.

"US Forces are postured throughout the European theatre, ready to defend the NATO alliance and to deter adversary activities," Neary said. "It's not just about us working with one country in one place – it's about this alliance working across the theatre in innovative ways."

Neary also visited the Commandant General of the Royal Marines, Maj Gen Matt Holmes. They discussed the importance of integrating the US Marines and Royal Marines on this deployment and future partnership opportunities.

NATO AWACS deploy to Poland

A NATO-operated Boeing E-3A Sentry airborne warning and control system (AWACS) deployed to Kraków, Poland, to take part in a bi-national training exercise with alliance members between August 21 and 28.

During the Aviation Detachment Rotation 20-4 exercise, the Sentry's crew worked with the Polish Control and Reporting Centre to provide command and control to Polish and US fighters. The rotation exercises take place regularly and are mandated under NATO's assurance measures, which were implemented following the Russian annexation of Crimea in 2014.

In a statement issued on August 21, NATO said: "These measures are in place to assure the alliance's eastern members of NATO's commitment and solidarity, as well as to deter any possible aggression against NATO members."

NATO operates 14 E-3A Sentry AWACS from Geilenkirchen air base in Germany. These aircraft regularly support a wide range of NATO-led operations, including the coalition fight against the so-called Islamic State.

As part of NATO's assurance measures, the fleet also conducts air surveillance flights, supports exercises and performs flyovers as a show of presence against possible aggressors.

Stratofortresses come to Europe

Above: ***Two B-52 Stratofortressess fly overhead at RAF Fairford, England, August 22*** *USAF/Senior Airman Eugene Oliver*

SIX US Air Force (USAF) Boeing B-52H Stratofortress bombers, belonging to the 5th Bomb Wing (BW) at Minot Air Force Base (AFB), North Dakota, deployed to RAF Fairford, UK, on August 22.

During their stay the aircraft will conduct flight and theatre familiarisation training across Europe and Africa, while working with NATO allies and regional partners. Shortly after arriving in Europe the bombers trained alongside Royal Norwegian Air Force Lockheed Martin F-16AM Fighting Falcons.

Their arrival in the UK is part of the USAF's recurring bomber task force Europe mission, which has recorded more than 200 sorties since 2018. The aim is to enhance the training and readiness of bomber crews, so they can respond to potential crises anywhere.

"B-52s are back at RAF Fairford and will be operating across the [theatre] in what will be a very active deployment," Gen Jeff Harrigian, commander of US Air Forces in Europe and Air Forces Africa, said. "Our ability to quickly respond and assure allies and partners rests upon the fact that we are able to deploy our B-52s at a moment's notice."

This deployment comes a month after the Department of the Air Force released its Arctic strategy, which detailed the importance of that region from a strategic perspective. Training in and around Norway provides an insight into operating in Arctic conditions, given its geographical location. Gen Eirik Kristoffersen, Norway's chief of defence, said: "I am very pleased that our American friends [chose] to practise in our surroundings. It is important that they are familiar with Norwegian conditions and can operate together with us if necessary."

Mirage 2000-5Fs in Alpha scramble

FRENCH Air Force Mirage 2000-5Fs simulated an Alpha scramble from Ämari air base in Estonia for a real-world intercept, France's Ministry of Defence announced on August 20.

An Alpha scramble is called to intercept any unidentified aircraft passing through Baltic airspace. The 'target' for the exercise was Estonian Air Force L-39 Albatros jet trainer, '15 White', which was intercepted for visual identification.

Left: ***Two French Air Force Mirage 2000-5Fs carry out a practice intercept of an Estonian Air Force L-39 Albatros as part of the enhanced Baltic Air Policing mission*** *French Air Force*

The simulated Alpha scramble from Ämari air base was carried out in co-ordination with Lithuanian air traffic controllers.

Two French Air Force Mirage 2000-5Fs deployed to Estonia for the enhanced Baltic air policing mission were involved in the exercise. The aircraft – carrying serial numbers 42 '2-EY' and 45 '2-EF' – were from Fighter Squadron 01.002 'Cigones' at Luxeuil.

Italy takes Baltic mission reins

THE ITALIAN Air Force was set to begin its NATO Baltic Air Policing (BAP) mission on September 8, with the German Air Force having already started flying from the Estonian Air Force base in Ämari.

Italy and Germany are taking part in two consecutive four-month rotations for the NATO air policing mission. This will be the fourth time for Italy and the twelfth for Germany that their air force contingents have been deployed over the Baltic states. The new rotation will be led by Italy from the Lithuanian Air Force base in Šiauliai. On September 1, the Italian section preparing to take the reins, participated in the mission handover ceremony in Šiauliai with the departing Spanish and UK contingents.

"The Baltic air policing mission is one of the best examples of NATO unity, demonstrating the Alliance's commitment to security," said Lithuanian Minister of National Defence, Raimundas Karoblis. "This is also shown by the readiness of the Italian and German Air Forces to carry out the air policing mission in the Baltic region as planned, despite the coronavirus pandemic."

The NATO BAP mission has been conducted continuously since 2004, when Lithuania, Estonia and Latvia became members of the Alliance. The Italian and German contingents' rotation is the 54th since the beginning of the mission. Following Russia's aggressive actions in Ukraine in 2014, the mission has been reinforced by Allied fighter jets. They intercept Russian fighters not complying with aviation safety rules when approaching the Baltic states' airspace. In the first eight months of this year, NATO fighters have been scrambled more than 80 times.

First A350 for Luftwaffe arrives

Lufthansa Technik handed over an Airbus A350-900 to the German Armed Forces on August 20 at a ceremony in Hamburg, marking the first of the type to enter government service.

The aircraft will be the Federal Ministry of Defence's special air mission wing flagship and it is the first of three to have been ordered. Originally carrying the civil registration D-AGAF, this example now carries serial 10+03.

It arrived at Lufthansa Technik at the beginning of May and is currently undergoing military certification which involves various flight tests being carried out to ensure it is operationally ready. Crew training is also taking place.

The Minister of Defence, Annegret Kramp-Karrenbauer explained: "The decision to purchase the new A350 fleet was made just [18 months] ago. With the new fleet we are securing global mobility as an important part of the federal government's ability to work.

"And with the addition of two more brand-new A350s, the mobility expected of an industrial nation like Germany is adequately ensured."

The A350-900 is equipped with a special transitional cabin for political-parliamentary flight operations. The cabin comes with office and conference areas, adjoined by a multifunctional lounge area. The remaining space is available for delegations flying on the aircraft.

Lufthansa Technik will fit a fully-fledged government cabin next year.

The flagship's sister aircraft 10+01 and 10+02 are under construction.

The first Airbus A350 for German government service is handed over *Airbus*

Two Airbus A321LRs for Germany

LUFTHANSA TECHNIK awarded Airbus Corporate Jets a contract on August 14 for two Airbus A321LRs for the German Air Force, a first for the type.

The A321LR (Long Range) will have a multi-role configuration, equipped for various missions, including troop transport and medical evacuation. They can take up to 163 passengers or six intensive care patients or 12 medium care patients, depending on the installed configuration. They have a maximum range of 7,800km or 9.5 flight hours.

"Lufthansa Technik and the German government have a long-standing relationship with Airbus and we are proud of this new milestone order with us," said Airbus Corporate Jets' president, Benoit Defforge.

The Airbus A321LR features fly-by-wire controls and centralised maintenance on all systems. Lufthansa Technik has already placed a further order on behalf of the German government for three Airbus Corporate Jet A350-900s.

Second MRTT A330 heads to Eindhoven

Airbus A330 MRTT T-054, the second aircraft for the NATO Multinational Multi-Role Tanker Transport fleet, takes off from the Airbus plant at Getafe on August 10. The aircraft flew to Eindhoven Airport using the call-sign 'MMF70' and wearing full marks and serial *Roberto Yáñez*

Final Single-seat AMI F-2000A

The last single-seater Eurofighter Typhoon F-2000A for the Italian Air Force flies above Turin-Caselle Airport on August 21 at the end of its second flight *Marco Rossi*

French Atlas to refuel helicopters

The French Air Force intends to add helicopter-refuelling flights by the A400M Atlas to its capabilities next year, after announcing that it has successfully transferred fuel from the Airbus aircraft to a French Army Airbus Helicopters H225M Caracal.

On July 22, the French Armaments Directorate (DGA) and Airbus Helicopters carried out the first refuelling test flight transferring fuel between the Atlas and the Caracal. The test campaign ran from July 20 to 31.

Previous tests had only carried out dry contacts, without transferring fuel.

The trials were intended to assess the aerodynamic behaviour of the aircraft and to check the feasibility of contact between the helicopter's refuelling probe and Atlas' drogue, which supplies the fuel.

The French Air Force can already refuel helicopters in-flight using Lockheed Martin KC-130J tankers.

The A400M can refuel fighters such as the Dassault Rafale or the Lockheed Martin C-130 or another A400M. The DGA Flight Tests Centre supervised the test campaign and the A400M and the Caracal were operated by a combination of DGA and Airbus crews.

Rafales boost I

IAF update as the Golden Arrows welcomes its first five Dassault F3-R fighters. Words **Mike Rajkumar**

Dignitaries and ground crew proudly line up with India's latest, greatest fighter *IAF*

The first batch of five Dassault Aviation Rafale F3-Rs (three single-seaters and two twin-seaters) landed at Ambala Air Force Station (AFS) on the afternoon of July 29, 2020, marking the entry of a new fighter type into the Indian Air Force. The station is home to 17 Squadron, the Golden Arrows, the unit having been resurrected in September 2019, to convert to the Rafale.

The ferry flight to India began with the Rafales taking off together from Dassault Aviation's facility in Merignac, France on July 27, 2020, followed by a planned stopover en route at Al Dhafra Air Base in the UAE. A distance of 5,800km was covered in 7hrs 30 mins during the first leg, followed by nearly 2,700km in the final leg.

Air-to-air refuelling for the first phase of the journey was provided by two accompanying French Air Force 'Phoenix' A330 MRTTs, one of which then landed in India with a cargo of 70 respirators and 100,000 COVID test kits. IAF Il-78 *Midas* refuellers supported the Rafales on their final leg, and, on arrival over Indian airspace, the formation was escorted by two Sukhoi Su-30MKIs.

IAF air and ground crew have undergone comprehensive training on the aircraft, including learning about its highly-advanced weapons systems.

The IAF's second Rafale squadron will be based out of AFS Hasimara in West Bengal. The force has been desperately trying to stem the decline in its combat fleet, which is expected to drop to an all-time low of 25 squadrons in 2022. The IAF combat inventory currently comprises the Sukhoi Su-30MKI, Mirage 2000TI 'Vajra', MiG-29UPG, Jaguar and MiG-21 *Bisons*, along with a sole LCA Tejas squadron based in the south of the country.

India has received ten Rafales, though five will remain in France for training purposes. The remaining 26 aircraft on order are slated for delivery by the end of 2021 (originally April 2022). As of June 30, Dassault had completed delivery of seven export Rafales, and will hand over another six later this year, making a total of 13 (India and Qatar). The export backlog for the type now stands at 40.

Further groups of IAF personnel will continue to be trained by Dassault in France until April 2021. The scope of training provided by the French airframer is thought to involve 27 pilots, 146 technicians and two engineers. Dassault has also offered to provide advanced training for three pilots, one engineer and six technicians.

Above: ***Aircrew and station staff pose with their new fighter*** *Mike Rajkumar* ***Below:*** ***An IAF Rafale lands at Ambala Air Force Station following its marathon ferry flight from France*** *Mike Rajkumar*

ndian Air Force

Ground crew chock the fighter on arrival in India *Mike Rajkumar*

History of the Golden Arrows

No 17 Squadron, Golden Arrows came into being on October 1, 1951 and was equipped with Harvard-IIBs, later fully converting to de Havilland Vampires, the IAF's first jet type. The Golden Arrows went on to become the first Indian squadron to operate the Hawker Hunter, the first swept-wing fighter in the air force. The squadron was equipped with the MiG-21M in 1975, and those aircraft were decommissioned in December 2011. In 1953, the newly independent India was the first export customer for French combat types since the 1930s, when orders were placed for 71 Dassault Ouragans. Known as Toofani (Typhoons) in IAF service, India ordered 113 examples. The country also committed to the Mystère IV and naval Alizé, followed by the Sepecat Jaguar and Mirage 2000.

A total of 36 Rafales were ordered via an Inter-Governmental Agreement (IGA) signed between India and France on September 23, 2016. The cost of each Rafale as announced by the Indian MoD is approximately €90 million.

The Indian Rafale deal is divided into two components, with Dassault Aviation being in charge of the Aircraft Package Supply Protocol (APSP) and MBDA handling the Weapons Package Supply Protocol. Snecma and Sagem (both Safran Group companies) and Thales are the other French companies with significant involvement. The €7.8 billion contract covered the procurement of 36 Rafale fighter aircraft, along with an initial consignment of weapons, Performance Based Logistics (PBL) maintenance support, simulators, training and associated equipment. The PBL is contracted for a period of five years, with an option to extend by an additional seven years. India has also contracted for 12 spare engines. Dassault will provide maintenance for IAF Dassault simulators for a period of ten years after expiry of the initial two-year warranty.

The Indian option clause for the deal mandates an offset provision worth 50% of the value of the aircraft and weapons package (excluding PBL and simulator annual maintenance). Dassault is also contracted to provide product support for a period of 50 years. India's state-owned airframer, Hindustan Aeronautics Limited (HAL) does not have any role in the Rafale deal at present.

IAF Rafale F3-Rs are unique in that they will also receive 13 'India Specific Enhancements' (ISE), requested by the air force, comprising software and hardware upgrades that will be retrofitted on the fleet, following the delivery of the last aircraft. Some of the upgrades pertain to the integration of a helmet mounted display sight (HMDS), high-altitude airfield operation capability, advanced sensors and electronic warfare (EW) pods.

The Rafales will usher in a new generation of weaponry for the IAF (and the region) by introducing MBDA's unique ramjet-powered Meteor long-range, beyond-visual-range air-to-air missile (BVRAAM); MICA air-to-air missile (AAM) and Franco-British SCALP-EG cruise missiles. Plus there's an emergency procurement of the AASM modular air-to-ground weapon. Essentially this comprises a guidance kit (inertial/GPS, inertial/GPS + infrared imagery and inertial/GPS+laser) and a range-increase kit fitted on the front and rear respectively of NATO bomb bodies. It can engage moving targets more than 50km away.

It is not yet known which version of the AASM is being supplied to India from French stocks. The French Directorate General for Armaments (DGA) ordered a new AASM 'Block 4' variant from Safran Electronics & Defence in December 2016, with deliveries slated for 2019. According to the DGA, as of January 2017, deliveries of more than 1,700 AASMs had taken place. Original IAF plans had called for the integration of Israeli Spice precision-guided munitions, and this will continue as planned.

The Rafales will also introduce Martin-Baker F16F ejection seats into the IAF inventory, adding to other seat variants from the same company, which are fitted on examples of the Sepecat Jaguar, Mirage 2000, BAE Systems Hawk Mk132 and Pilatus PC-7 MkII as well as the HAL's Tejas and HJT-16 Kiran jet trainer. India is the second largest customer for Martin-Baker, with the air force and navy accounting for 1,013 of the company's ejection seats in service today. Martin Baker ejection seats are also being fitted on HAL's in-development HTT-40 turbo trainer and HJT-36 Sitara.

A Rafale is refuelled over the sea during its 8,500km, two-stage flight to India *IAF*

New fighters for Air National Guard

The US Air Force (USAF) announced on August 14 that it would equip Air National Guard (ANG) bases in Florida and Oregon with Lockheed Martin F-35A Lightning IIs and Boeing F-15EX Advanced Eagles from 2022.

Kingsley Field Air National Guard Base (ANGB) in Oregon, will be the first to receive the new fighters in 2022 and it will host the USAF's first F-15EX formal training mission.

Portland ANGB, also in Oregon, will be home to the first operational F-15EX squadron from 2023. Meanwhile Jacksonville ANGB in Florida is scheduled to take delivery of its first F-35A fighters in 2024. These ANGBs already operate Boeing F-15C/D Eagles.

"The Air National Guard has consistently stepped up to meet the challenges of countless national contingencies over recent years," Lt Gen Mike Loh, director of the ANG, said.

"Transitioning to these new weapon systems will maintain our effectiveness as a member of the Total Air Force into the future."

This move comes as the USAF seeks to withdraw its ageing F-15C/D Eagle fleets by the mid-2020s, replacing the aircraft with the air force's latest fighter aircraft.

The service is also keen to replace the F-15C/Ds at Barnes Airport in Massachusetts; Fresno Yosemite Airport, California and Naval Air Station (NAS) Joint Reserve Base New Orleans in Louisiana. Further to this, the USAF is considering basing F-35As at NAS Lemoore, California.

Before making a final decision on the additional bases, the USAF will conduct an environment impact analysis process. This is set to comprise site surveys that will assess the potential impacts to existing mission sets, operational requirements, base infrastructure, manpower and costs relating to basing the new aircraft at these locations.

388th Fighter Wing triumphant

THE US Air Force 388th Fighter Wing (FW) at Hill Air Force Base, Utah, which operates the Lockheed Martin F-35A Lightning II, has claimed a successful deployment to the United Arab Emirates.

For 16 months, airmen have been deployed in combat by the 388th FW. Its three units, 4th Fighter Squadron (FS) 'Fighting Fuujins', 34th FS 'Rude Rams' and 421st FS 'Black Widows' were there in support of the Air Force Central Command mission at Al Dhafra Air Base, United Arab Emirates. The three squadrons were joined by 419th Fighter Wing reservists. The 34th FS deployed to Al Dhafra in October 2019 and generated its first combat sortie within 24 hours. The unit states it did not lose a single sortie to a maintenance issue for the next eight months. The squadron returned home in June and July.

"Our airmen continue to carry out the combat mission the air force asks of us," said 388th FW commander, Col Steven Behmer. "Not only that, but they are truly on the leading edge of developing how our service employs this very capable fighter, now and in the future."

The 388th FW's pilots performed strafing runs on close air support missions, and maritime escorts for US Navy carrier strike groups. According to Capt Susan McLeod, officer in charge of the 34th Aircraft Maintenance Unit, the F-35 is "less needy in terms of maintenance than people may expect". As of August, the 421st FS was still deployed.

Right: An F-35A Lightning II assigned to the 34th Expeditionary Fighter Squadron departs after conducting an aerial refuelling with a KC-135 Stratotanker assigned to the 28th Expeditionary Air Refuelling Squadron above the Arabian Gulf, December 3, 2019 *USAF/Staff Sgt. Daniel Snider*

F-35 student pilots regain lost time

Lockheed Martin F-35A Lightning II students from Eglin Air Force Base's (AFB) 58th Fighter Squadron travelled to Fort Worth, Texas, in July to use simulators to catch up on missed training.

The student pilots had fallen behind in their training due to COVID-19. They spent four days at the Lockheed Martin plant where the simulators are located. They, and other student in attendance, accomplished 136 sorties and more than 170 simulation hours.

The air force said the short course had made up for two weeks of missed training. During their time there the students focused on mission areas critical to the F-35A with each training day averaging between 10 and 12 hours.

"The virtual simulation training provides the 33rd Fighter Wing with advanced training scenarios in a robust threat environment to maximize student training in a short period," said Maj Paul Gannett, 33rd OSS assistant director of operations.

The 117th Air Refuelling Wing provided military transport on a KC-135 Stratotanker refueler to comply with COVID-19 travel and social distancing guidance. Standards for social distancing and mask-wearing were strictly enforced throughout the trip, Gannett added.

About 25 personnel attended the training event from a number of units. They included Eglin's 33rd Operations Group's 58th Fighter Squadron and the 33rd Operations Support Squadron; Tyndall AFB's 81st Air Control Squadron and the 964th Airborne Air Control Squadron from Tinker AFB, Oklahoma. The Fort Worth based air force reserve unit, the 457th Fighter Squadron, acted as the opposing force during the training simulation.

USAF and RNLAF F-35s prove CMDx

US AIR Force and Royal Netherlands Air Force (RNLAF) F-35 Lightning II pilots flew over Naval Air Weapons Station China Lake, California, on August 13-14 to evaluate their data interoperability.

The flight test evaluation was designed to show that each pilot could receive the same common operating picture. The exercise used two USAF and two RNLAF F-35s operating with the same mission data. Improving future combat data sharing between the US Services, F-35 programme international co-operative partners and foreign military sales customers is a goal of the programme. With the analysis still ongoing, the initial feedback from the flight tests has indicated the interoperability was a success. This concept will allow commanders to operate a mixture of F-35s regardless of their variant or nationality.

"The demonstration is paving the way for a new level of combat effectiveness," said F-35 Joint Programme Office executive officer, Lt Gen Eric Fick. "We need to think differently across the F-35 enterprise about how we provide high-quality mission data to our coalition partners," so they can ensure there is that common operating picture.

Coalition mission data, referred to as CMDx, is the concept that provides all operating participants with an equivalent source of data. This gives coalition air component commanders the assurance that all their assets are seeing the same thing. Demonstrating the feasibility and effectiveness of CMDx over the China Lake test range involved test pilots from the F-35 Joint Operational Test Team at Edwards AFB, California, and pilots from Luke AFB, Arizona.

Royal Netherlands Air Force F-35A F-006 taxies out at Luke AFB, Arizona, on August 13 to depart for a China Lake test range to carry out the first CMDx test *USAF/Staff Sgt Alexander Cook*

Green Flag-West has a Hornet's sting

An F/A18F Super Hornet assigned to Strike Fighter Squadron 41 'Black Aces', Naval Air Station Lemoore, launches during Green Flag 20-9 at Nellis Air Force Base, August 19, 2020 *USAF/Airman 1st Class Dwane R. Young*

NELLIS AIR Force Base conducted its annual Green Flag-West 20-9 exercise in August with the help of the Naval Air Station Lemoore-based Strike Fighter Squadron 41.

Green Flag-West is a realistic air-land integration combat training exercise involving all four military services, including the guard and reserve components, and sometimes US allied nations. Conducted in conjunction with US Army Combat Training Centre exercises at Fort Irwin in California, Green Flag focuses on close air support and joint exercise, administered by the US Air Force Air Warfare Centre at Nellis. Green Flag exercises involve about 3,000 sorties, 6,000 flight hours, and the expenditure of over 700,000 pounds of live and training ordnance.

Strike Fighter Squadron 41's Boeing F/A-18F Super Hornets are able to perform air superiority missions, strikes with precision-guided weapons, close air support and the suppression of enemy air defences. The type carries 33% more internal fuel, increasing mission range by 41% and endurance by 50% over earlier Hornet variants.

A typical Green Flag exercise involves two multi-role fighters, such as the F/A-18F or Boeing F-15 Eagle, or a bomber like the Boeing B-1B Lancer or Boeing B-25H Stratofortress. Unmanned aircraft systems also participate and they can be the General Atomics Aeronautical Systems MQ-9 Reaper or Textron Systems Shadow tactical unmanned aircraft system. Electronic warfare aircraft involved include the Lockheed EC-130 and Lockheed EP-3. For aerial refuelling, Boeing KC-135 Stratotankers and McDonnell Douglas KC-10 Extenders are used. Additionally, USAF Boeing E-3 Airborne Warning and Control System and Northrop Grumman E-8C Joint Stars monitor and support many aspects of both air and ground force manoeuvres.

Green Flag-West was previously designated Air Warrior and stood up in 1981 in conjunction with the US Army's establishment of the National Training Centre. Tasked to plan, control and execute the air component's involvement in the exercise, the 549th Combat Training Squadron's mission is to train Joint and Coalition personnel in the integration and employment of air, space and cyber power in conjunction with ground force operations.

Lightning IIs make Red Flag Alaska debut

US AIR Force F-35A Lightning IIs participated in Red Flag – Alaska (RF-A) for the first time when it took place at Eielson Air Force Base (AFB), Alaska from August 3-14.

Flying participants completed roughly 560 sorties and racked up about 1,500 flying hours by the end of the exercise. The 354th Fighter Wing, 356th Fighter Squadron 'Green Demons' F-35As, newly-based at Eielson AFB, played the Blue Air side during RF-A 20-3. Another participating F-35A unit was the 388th Fighter Wing based at Hill AFB, Utah.

Lt Col Gregory Hunger, the 353rd Combat Training Squadron commander, said: "We had a lot of challenges, the biggest one being COVID. [But] we were able to reduce the footprint of COVID without sacrificing the training and the high-end combat capability that participants will walk away with."

Tigersharks complete Apache V6 training

Ten aircrew from the 1-229th Attack Reconnaissance Battalion (ARB) 'Tigersharks' at Joint Base Lewis-McChord (JBLM), Washington, completed training on July 24 for version six (V6) of the Boeing AH-64E Apache.

The 1-229th ARB is scheduled to be the first unit to be equipped with the AH-64E V6, the first being due at JBLM in October. The V6 has a number of upgrades, including improved sensors and navigation. All 24 of the V6s for the 1-229th ARB are expected to be delivered by March next year. Having already trained pilots on the new variant, the unit will fly to the Boeing plant in Mesa, Arizona, to pick up the helicopters themselves.

Lt Col Kevin Easter, 1-229th commander, said: "The sensor suite upgrades provide increased range and lethality. The improvements to the battalion's tactical navigation...will better assist them in manoeuvring to the target and destroying it."

The next units to receive the AH-64E V6 will be the 3rd Squadron 17th Cavalry Regiment at Hunter Army Airfield, Savannah, Georgia, and the 4th Aerial Reconnaissance Battalion (Attack), 2nd Aviation Regiment at Camp Humphreys, Korea.

One of four former test Boeing AH-64E Version 6 Apaches flies in front of Mount Rainier, Washington, during training for aircrew from the 1-229th Attack Reconnaissance Battalion at Joint Base Lewis-McChord, the first unit to transition to the new variant *US Army/Chaplain (CPT) Joshua Hughes*

Black Hawk upgrade for New York Army Guard

Two Sikorsky UH-60M Black Hawk helicopters, the first of 20, arrived on August 18 at the Islip MacArthur and Albany International airports' flight facilities for the New York Army National Guard.

The UH-60M, Mike model, helicopters are replacing the New York Guard's UH-60L, or Lima, versions. The New York Army National Guard helicopters are assigned to the Ronkonkoma-based 3rd Battalion, 142nd Aviation Headquarters Company. The UH-60M is the latest design for the Black Hawk incorporating upgraded GE Aviation T700-GE-701D engines, improved rotor blades, a fly-by-wire glass cockpit, plus improved flight controls and aircraft navigation. Qualification training for pilots includes a six-week transition course at either Fort Rucker, Alabama or the Eastern Army Aviation Training Site located at Fort Indiantown Gap, Pennsylvania.

"For us, this fielding puts us on par with the rest of the army," said Maj Gen Ray Shields, the Adjutant General of New York. "This finally moves us from 1980s generation aircraft up to the modern era." A lot of the existing ANG UH-60 fleet is older than many of the pilots. The new aircraft cost about $21m each.

While the flight characteristics of the UH-60M are similar to previous Black Hawks, the digital cockpit requires some training for pilots, said Chief Warrant Officer 4 Thomas Scott, a standardisation pilot in the 3rd Battalion. "There is an entirely new set of visual cues and available information," Scott said after his flight from Lakehurst, New Jersey to the flight facility in Latham, New York. "So many calculations made by pilots in previous models are now presented to us in the Mike model. It makes crew work much easier and efficient."

An additional ten aircraft will be fielded to detachments of the battalion serving in the Connecticut and Maine Army National Guard. More than 2,000 UH-60 Black Hawk helicopters are in service with the US military.

The army is fielding M models through to 2026, purchasing more than 950 airframes. The UH-60Ms are manufactured at the Sikorsky plant in Stratford, Connecticut, and complete the army's test flights prior to acceptance and delivery at the US Army Communications-Electronics Research, Development and Engineering Centre Flight Activity on Joint Base McGuire-Dix-Lakehurst, New Jersey.

Above: ***A UH-60M Black Hawk, fresh from the manufacturer, at Army Aviation Support Facility #3. The new Black Hawks feature a 'glass' cockpit, which is fully digital compared with the analogue instruments in previous models still widely used across the state of New York*** *US Army National Guard photo by Ryan Campbell*

USAF activates 15th Air Force

The 15th Air Force was activated by the US Air Force on August 20, amalgamating wings and units from Air Combat Command's (ACC) 9th and 12th Air Forces.

The 15th AF, headquartered at Shaw Air Force Base, South Carolina, brings together all of ACC's conventional aircraft capabilities under one command. These include, fighters, remotely piloted aircraft, command and control, reconnaissance, aerial targets and search and rescue units. It also encompasses various ground-based units that were previously elements of the 9th and 12th Air Forces. In addition to organising, training and equipping ACC's conventional forces, this new command will have a deployable joint task force-capable headquarters that provides command and control of integrated ACC forces.

Gen Mike Holmes, Air Combat Command commander, said: "Consolidating these forces in 15th Air Force is another step toward implementing the air force's new force generation construct and will enable the delivery of dynamic and agile combat airpower as directed by the National Defence Strategy."

Following this transition, 12th Air Force will focus on its component role for US Southern Command as 12 AF/AFSOUTH. Meanwhile, the existing 9th Air Force will be deactivated and Air Force Central Command (AFCENT) will be re-designated as 9 AF/AFCENT. The creation of the 15th AF is part of a larger force optimisation effort within ACC, which began with the stand-up of the 16th Air Force, an information warfare force, last autumn.

The 15th Air Force was first established in 1943 as the Mediterranean theatre's air force. After World War Two, it was part of Strategic Air Command, deterring Cold War Soviet aggression. Later it transferred to Air Mobility Command in 1992 as an expeditionary task force, before being deactivated in 2012. No units will be physically moving as a result of the change.

Six USAF Thunderbolt II go to Guam

SIX United States Air Force A-10C Thunderbolt IIs from the 51st Fighter Wing's 25th Fighter Squadron (FS) 'Assam Dragons' completed a training deployment to Andersen Air Force Base, Guam, on August 21.

They had arrived at the base in the Northern Marianas Islands on August 10 to hone their weapons delivery skills on the Farallon de Medinilla Range. They also conducted routine flight training, wingman tactics familiarisation and in-flight refuelling.

USAF A-10 pilot, 1st Lt Austin Lasch, said: "We will be ready to operate side-by-side with our allies when needed, and our combined training in the Indo-Pacific region will allow us to do so seamlessly."

The 25th FS regularly participates in training events that take place in the Indo-Pacific, such as Cobra Gold and the Rim of the Pacific. Through events such as these, the 25th FS is able to strengthen and build relationships with partner nations.

***Above:** US Air Force A-10C Thunderbolt II 79-0106 'OS' from the 25th Fighter Squadron at Osan Air Base, South Korea, taxies out at Andersen AFB, Guam, prior to a routine training mission on August 17* USAF/Senior Airman Michael S Murphy

USMC Ospreys arrive Kuwait side

SEVERAL US Marine Corps MV-22B Ospreys were unloaded from the US-flagged vessel MSC Green Ridge on August 7 at the Port of Shuaiba, Kuwait after being shipped from the United States.

The Ospreys will be assigned to Marine Medium Tiltrotor Squadron (VMM) 166 (Reinforced) 'Sea Elks' as part of Special Purpose Marine Air-Ground Task Force - Crisis Response - Central Command (SPMAGTF-CR-CC) 20.2. The Ospreys included the VMM-164 'Knight Riders' aircraft, tail code, 'YT-06,' bureau number (BuNo) 168348 and the tail code 'YT-05' which has the BuNo 168625.

The VMM-364 'Purple Foxes' aircraft with the tail code 'PF-09' and BuNo 168674 was also offloaded.

After being unloaded and undergoing pre-flight checks, they flew out on August 10 to swap over with other Ospreys already deployed in the region to maintain SPMAGTF-CR-CC aircraft readiness requirements.

***Above:** US Marines from VMM-166 (Reinforced) assigned to Special Purpose Marine Air-Ground Task Force, Crisis Response, Central Command conduct a pre-flight inspection of VMM-364 MV-22B Osprey 168674 'PF-09' on August 10 at the Port of Shuaiba, Kuwait, where it had been unloaded three days earlier as part of an aircraft swap over* USMC/Cpl Cutler Brice

Canadair CT-114 Tutor fleet flies again

THE ROYAL Canadian Air Force (RCAF) lifted the operational pause of its Canadair CT-114 Tutor jet trainer fleet on August 24 after a thorough technical and operational risk analysis.

Brig Gen Denis O'Reilly, commander of the RCAF's 2 Canadian Air Division, lifted the operational pause, after receiving recommendations for risk mitigation measures from the technical and operational risk analysis. The pause was implemented in May following the second CT-114 incident within eight months. The second incident involved Canada's national aerobatic team. A 431 Air Demonstration Squadron 'Snowbirds' Tutor crashed in Kamloops, British Columbia (BC) killing Capt Jennifer Casey, the Snowbirds public affairs officer.

According to the Canadian government, "the scope of the [technical and operational risk] analysis was designed to be deliberate, detailed and broad to enhance the general safety of the CT-114 Tutor operations." The new risk mitigation measures will place some restrictions on flying operations while increasing the focus on the fleet's maintenance requirements. The RCAF's directorate of flight safety continues to investigate the Kamloops accident. Once complete, the air arm will determine if additional measures are required to further mitigate the risk of future incidents.

As a result of the May incident and the grounding of the CT-114 fleet, the Snowbirds' 2020 display season was cancelled. The team will now gradually resume flight operations before returning to Canadian Forces Base Moose Jaw in Saskatchewan, BC, from Kamloops, where the aircraft have been since May.

Armenia to modernise its Su-25 fleet

United Aircraft Corporation (UAC) and the Republic of Armenia's Ministry of Defence (MOD) have signed a contract to modernise the country's Sukhoi Su-25 fleet.

The deal was agreed at the International Military Technical Forum in Moscow on August 23 by UAC deputy general director for sales and marketing, Ilya Tarasenko, and the Armenian Deputy Minister of Defense, Makar Gambaryan. United Aircraft also met with representatives of the People's Republic of China and the Republic of India during the forum.

At the same event, UAC also signed contracts with the Russian MOD for the supply of fighter aircraft from next year to 2025. The Sukhoi Design Bureau's Su-35S, described as "4++ generation" by UAC, will be supplied along with the Sukhoi Su-34, Irkut Corporation Su-30SM2, Yakovlev Design Bureau Yak-130 training aircraft and Ilyushin Il-76MD transport aircraft. A servicing deal was also agreed covering Ilyushin transports.

"The contracts signed today will allow us to load our factories and provide our production and design teams with work for several years ahead," UAC general director, Yuri Slyusar, said. "Loading will increase along the entire chain of cooperation. And the Aerospace Forces will get ahead of time with modern aviation systems."

Upgraded Tu-95MSM makes first flight

The first extensively-upgraded Russian Air Force Tupolev Tu-95MSM, RF-94121 '21 Red' (c/n 1000214834666) "Samara", takes off from the Beriev facility at Taganrog for its first flight on August 22. *Beriev*

Russian MOD orders two VIP helicopters

Russian Helicopters announced on August 26 at the International Military-Technical Forum, held near Moscow, that the Ministry of Defence (MOD) of the Russian Federation has ordered two VIP Kazan Helicopters Mi-38 rotorcraft.

The Mi-38 has an aluminium alloy fuselage with component parts made of steel, titanium and composite materials. Its six-blade main rotor provides high thrust and low vibration levels according to Russian Helicopters. The blades are also equipped with an anti-icing system. The blades' single rotor is driven by two Russian made TV7-117V engines which have dust and air purification protection. Russian Helicopters also states that the Mi-38's X-shaped tail rotor gives the helicopter excellent handling and a low noise level. The range of the transport version is up to 1,200km using additional fuel tanks.

"The fact that our customers are interested in Mi-38 confirms that we have chosen the right concept, where the helicopter belongs to a segment between Mi-26 and Mi-8," said Russian Helicopters director general, Andrey Boginsky. The Mi-38 cockpit has five liquid crystal displays screens and a satellite navigation system. With a maximum take-off of 15.6 tonnes, the helicopter can accommodate 5 tonnes of payload on board or on an external sling.

The first serial production Mi-38 was unveiled at the MAKS-2019 International Aviation and Space Salon. In February 2020, the first serial production VIP Mi-38 was handed over to Gazprombank Leasing. The Russian MOD has already received two Russian Helicopter Mi-38T transport and troop landing helicopters which are undergoing operational tests.

The first of the two new VIP Mi-38s ordered by the Russian MOD, registration number RA-14340, at the Kazan Helicopter Plant on September 4, already painted in the colours of the Russian Air Force Special Flight Unit *Press Office of the Republic of Tatarstan*

Lions of the South roar

THE ISRAELI Air Force's (IAF) second Lockheed Martin F-35I 'Adir' unit – 116th Squadron 'Lions of the South' – was declared officially operational on August 6 after six months of training.

Israel's 116th Squadron was stood up as an F-35I unit on January 16, 2020 and before it was declared fully operational in August, the unit underwent a six-month work-up process. The F-35I Adir is Israel's version of the Lockheed Martin F-35A Lightning II conventional take-off and landing variant. During this period, the squadron defined training processes and planned its operational tactics. Unit personnel also faced a number of scenarios to prepare them for real situations and for a week-long operational fitness inspection. The inspection took place before the squadron attained its operational status.

IAF F-35I Adirs of the 116th 'Lions of the South' Squadron *IAF Amit Agronov*

"The operational fitness inspection provides an official seal of approval for the operational capability of the 116th Squadron to carry out all the missions of the 'Adir' division," said Maj 'Edi', the 116th Squadron's technical officer.

"The squadron's tasks include its management during routine and periods of war, as well as maintaining functional continuity."

The operational fitness inspection simulated 72 hours of intense combat. Maj Edi explained that during the inspection they worked for 16 hours a day and rested for the remaining eight. The squadron operated in shifts, to simulate its activity during warfare. The simulated attacks included missiles and personnel coped with casualties and fires that would be consequences of any such an attack. "They examined our decision-making process, management during combat and ability to maintain functional continuity. That is just one example out of many. There wasn't a single scenario that we were not prepared for," Maj Edi explained.

Personnel were not informed what scenarios they would face as part of the operational fitness inspection prior to the test week taking place. This was to provide a more realistic setting because it is not always possible to anticipate what will happen in combat situations. Maj 'G', leader of the operational fitness inspection and an aircrew member with the 'Lions of the South', said: "The inspection simulated the operational arena and the current regional tensions.

Several scenarios led to a simulated war on all fronts, and aircrew members took off for missions in all of Israel's regions."

First Brazilian Air Force pilot flies Saab Gripen E

A BRAZILIAN Air Force test pilot flew the Saab JAS39 Gripen E for the first time on August 20 at Saab's facility in Linköping, Sweden.

After several months of training, Maj Aviador Cristiano de Oliveira Peres took off in Gripen E serial number 4100 from the Saab facility, undertaking a 49-minute sortie over the Baltic Sea.

Cristiano de Oliveira Peres arrived in Linköping in January to undergo conversion training in a Gripen D. He had many hours in a flight simulator, qualifying in a 9G centrifuge and training for specific flight test techniques for the Gripen. He is now in the final stages and will shortly join the Gripen Flight Test team at Linköping as a representative of the Brazilian Air Force. He has already participated in an operational evaluation of the aircraft.

Brazil has placed an order for 36 Gripen E/Fs, comprising 28 single-seat Gripen Es and eight twin-seat Gripen Fs. The Brazilian Air Force uses the designation F-39 for the Gripen and serial number 4100 is one of the 36 currently on order. The first Brazilian aircraft, a single-seater, made its maiden flight on August 26, 2019, flown by a Saab test pilot.

Brazilian Air Force test pilot Major Aviador Cristiano de Oliveira Peres taking off from Linköping in Sweden on August 20 in the Saab JAS39 Gripen E, serial number 4100, marking the first sortie in the type by a Brazilian pilot. Brazil has 28 Gripen Es and eight Gripen Fs on order from the manufacturer *Saab*

Leonardo AW139 is new Colombian Presidential helicopter

THE COLOMBIAN Air Force made the announcement on August 14 that it plans to acquire a Leonardo AW139 to serve as the country's new Presidential helicopter.

Expected to enter service around April 2021, the type was selected as being the most appropriate to meet the Presidential helicopter requirements following an evaluation of a variety of alternative options.

The AW139 will replace the Bell 412EP, serial number FAC0006, which was written-off in a crash on October 25, 2019, that resulted in the deaths of all six crew members on board (see *Attrition*, December 2019, p89).

In addition, the Colombian Air Force announced on August 29 that it is to acquire Cessna 172 Skyhawks for primary training at the military aviation school. Deliveries of the new aircraft will begin in June 2021.

These will progressively replace the Cessna T-41 Mescaleros currently used in the role. The Mescaleros were acquired by Colombia in 1968 and have accumulated 52 years of uninterrupted service.

Ex-Italian Coast Guard AB412 lands in Uruguay

URUGUAY'S MINISTRY of National Defence announced on August 14 that the first of two Agusta-Bell 412CP Grifone helicopters acquired for the Uruguayan Navy had arrived in Montevideo.

A video released by the Ministry showed it being delivered on a flat-bed truck, still completely shrink-wrapped in plastic. The second helicopter is scheduled to arrive before the end of the year. Both will be operated by the Helicopter Squadron at Laguna del Sauce.

The two AB412CPs had previously been operated by the Italian Coast Guard, which withdrew the type from service in March 2017. They were purchased by Uruguay in 2018 and are configured for search and rescue. They have a capacity for up to 13 personnel and are expected to also support military and maritime interdiction missions.

Above: ***Still shrink-wrapped following its delivery voyage, the first of two Agusta-Bell 412CP Grifone helicopters for the Uruguayan Navy arrives in Montevideo on the back of a flat-bed truck on August 14, 2019*** *Uruguayan Ministry of National Defence*

Rwandan AF to get its first fixed-wing aircraft

TEXTRON AVIATION announced on August 11 that it had been awarded a contract by ATI Engineering Services for two Cessna 208B Grand Caravan EX multi-mission aircraft for the Rwandan Defence Force.

They are expected to enter service in the first half of 2021 and will primarily be based at Kigali, Rwanda. They will become the first fixed-wing aircraft in the Rwandan Air Force, which operates only helicopters.

They will support the African Partnership Flight initiative, which brings together African nations to strengthen US strategic partnerships. Through the programme, key countries in Africa exchange ideas on aviation-related topics, and enhance regional co-operation and interoperability.

ATI was awarded a $10.1 million foreign military sales contract to supply the aircraft on June 24 – see *Rwanda orders two Cessna 208B Grand Caravan EXs*, September, p20.

The new deal covers the purchase of airframes for this contract, which ATI will modify and fit with a range of equipment. This will include, secure high-frequency and ultra high-frequency radio systems and a night-vision imaging system, as well as interior/exterior lighting.

The aircraft will also be fitted with reconfigurable multi-mission interiors that have two ambulatory medical stretcher kits, 11 passenger seats, eight collapsible utility seats and a removable rollerball cargo floor.

$36.1m Nigerian Super Tucano base

***Above:** The first Nigerian Air Force (NAF) Embraer A-29B Super Tucano outside the Embraer Defence and Security final assembly line in Jacksonville, Florida, after being painted up in NAF colours* Embraer ***Right:** Sierra Nevada Corporation and Embraer Defence & Security conducted the inaugural flight of an Embraer A-29 Super Tucano aircraft for the Nigerian Air Force in Jacksonville, Florida, April 16. Twelve A-29s will be based at the new US Army-built facility in Nigeria* USAF

THE NIGERIAN Air Force is building facilities for 12 Embraer A-29 Super Tucanos, at a cost of $36.1m.

The work, being carried out by the United States Army Corps of Engineers, includes perimeter and security fencing, munitions assembly and storage, small arms storage, a flight annex wing building for simulator training and airfield lighting. The airfield apron, parking, and hangar entry control point will also be improved. The contract was awarded on August 28 by the US Air Force Security Assistance and Cooperation (AFSAC) directorate's foreign military sales construction division.

"With this recent contract award, we are ready to be part of the modernisation of Nigerian Air Force facilities and infrastructure," said Brig Gen Brian Bruckbauer, director of the AFSAC directorate. "As a member of the Nigeria A-29 FMS [foreign military sale programme], and this being AFSAC's first major construction project in sub-Saharan Africa, we are thrilled to be able to support the Nigerian people in advancing their defensive capabilities."

French Transall's farewell tour of Africa

THE LAST French Air Force Transall C-160 deployed overseas completed a memorial tour of African countries in August marking the end of its 50 years of operations on the continent.

During the tour, paratroopers from the 43rd Marine Infantry Battalion boarded the aircraft at Forward Operating Base (BAP) Abidjan, Côte d'Ivoire, for their last jump from the type. In addition to being welcomed by the French Forces in Côte d'Ivoire at Abidjan, the C-160 and its crew also visited other French BAPs in Central and West Africa.

The permanent French Transall detachments to the region officially came to an end on July 31. On that date, a French Air Force Lockheed Martin C-130J Hercules arrived at BAP Niamey, Niger, to take over responsibility for the detachment as part of the operational transport group (GTO).

As with the Transall, one Hercules will be permanently based with the GTO to support French missions in the region. Although operations with the Transall are winding down, the type will continue in French Air Force service for a few more years. The last few are scheduled for retirement in 2023.

The last French Air Force Transall C-160 on overseas operations, C-160R serial number R211 '64-GK' from ET.64, takes on paratroops for the final time in Abidjan during its farewell tour of Africa EMA

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India to buy 106 HTT-40 trainers

INDIA'S DEFENCE Acquisition Council approved the acquisition of 106 Hindustan Aeronautics HTT-40 basic trainers at a meeting on August 11, to meet the Indian Air Force's (IAF) requirements.

The procurement decision is aimed at strengthening the armed forces and the economy by relying on an indigenous capability, as part of the government's self-reliant India initiative.

Prototypes of the HTT-40 are already flying and the certification process is under way. Once certification is achieved, an initial 70 of the type will be procured from HAL and the remaining 36 will be ordered once the HTT-40 is operational with the IAF.

South Korea retires Huey

AN OFFICIAL ceremony was held on July 31 to mark the final retirement of the last Bell UH-1H Iroquois helicopters in Republic of Korea Army (ROKA) service.

The retirement ceremony was presided over by Aviation Operations Command Commander Maj Gen Kang Sun-young. The ROKA put the type, also known as the Huey, into service on December 12, 1968. Over 52 years the Army's 129 UH-1Hs accumulated 792,000 flying hours and flew more than 146 million kilometres. The type is being replaced by the indigenously developed KAI Surion.

***Left:** The retirement ceremony on July 31 for the Republic of Korea Army Bell UH-1H Iroquois* Republic of Korea Ministry of Defence

Screaming Eagles deploy to Japan

US Navy Boeing P-8A Poseidons, serial and code numbers, 169329 'YP-329,' and, 169343 'YP-343,' from Patrol Squadron 1 (VP-1) 'Screaming Eagles' at Naval Air Station Whidbey Island, Washington, sit on the flightline at Naval Air Facility Misawa, Japan, on September 1. VP-1 has seven Poseidons in Japan: five at Kadena and two at Misawa. In the foreground is a visiting Lockheed EP-3E Aries II from Fleet Air Reconnaissance Squadron 1 (VQ-1) 'World Watchers,' a unit which is also based at Whidbey Island, but maintains a detachment in Japan at Kadena US Navy/Mass Communication Specialist Seaman Benjamin Ringers

Four more Afghan Super Tucano deliveries

FOUR ADDITIONAL Afghan Air Force Embraer A-29B Super Tucanos passed through Glasgow Prestwick Airport, Scotland, on August 23 during their delivery flight.

Carrying their US Air Force (USAF) serial numbers, they were 13-2003, 13-2005, 13-2011 and 13-2016, callsigns 'Raven 81' to 'Raven 84.' Their Afghan serials had already been applied, but were taped over, although on one aircraft, 13-2001, Afghan serial YA-1511 was discernible. They arrived at Prestwick from Reykjavik, Iceland, stopping for just one hour before continuing to Nice, France, eventually arriving in Kabul, Afghanistan, on August 28.

They came from the 26 already delivered to Moody Air Force Base (AFB), Georgia. At Moody they are flown by the USAF's 14th Flying Training Wing, 81st Fighter Squadron to train Afghan pilots. Of these 26, 15 had already been transferred to Afghanistan before the new delivery, which left seven at Moody.

Four More F-35As delivered to ROKAF

FOUR REPUBLIC of Korea Air Force (ROKAF) Lockheed Martin F-35A Lightning IIs departed Naval Air Station Joint Reserve Base Fort Worth, Texas, on August 25 to begin their delivery flight to South Korea.

The flight comprised the 21st to 24th production aircraft, serial numbers 20-021, 20-022, 20-023 and 20-024. Support was provided by US Air Force Boeing KC-135T Stratotanker, serial 58-0042, from the 22nd Air Refuelling Wing at McConnell Air Force Base (AFB), Kansas.

The F-35As will join the 17th Fighter Wing at Cheongju, where the first 16 aircraft had already been delivered by January for operation by the 151st and 152nd Fighter Squadrons. On May 2 a further two, the 19th and 20th production aircraft (serials 20-019 and 20-020) were flown to Luke AFB, Arizona, for ROKAF pilot training.

The latest deliveries bring the total known to be in ROKAF service to date to 22. Two others, the 17th and 18th production aircraft (serials 20-017 and 20-018), were both noted at Fort Worth earlier this year, but their delivery remains unconfirmed. On December 17, 2019, during a ceremony at Cheongju the ROKAF declared initial operating capability for its F-35As. The ROKAF has ordered 40 F-35As and plans to purchase a further 20.

Four ROKAF Lockheed Martin F-35 Lightning IIs departed on delivery on August 25, 2020 from Naval Air Station Fort Worth, Texas, comprising 20-021, 20-022, 20-023 and 20-024 along with tanker support, Boeing KC-135T 58-0042 from the 22nd Air Refuelling Wing at McConnell AFB *Michael Keaveney*

Philippine Air Force Super Tucanos on delivery

ALL SIX of the Embraer A-29B Super Tucanos ordered by the Philippine Air Force (PAF) began their delivery flight on August 29 from São José Dos Campos, Brazil.

They were in full PAF colours, with serials taped over and wearing temporary ferry registrations PT-ZZM, PT-ZZN, PT-ZZO, PT-ZZQ, PT-ZZS and PT-ZZU. The serials will be 1901 to 1906, respectively. They will be operated by the 15th Strike Wing at Danilo Atienza Air Base, Cavite, supplementing the remaining North American Rockwell OV-10A/C Broncos flown by the 16th Attack Squadron.

After leaving the factory, the A-29B's made stops in Brazil, at Recife, then Fernando de Noronha the following day. The next stops were due to be Sal-Amilcar Cabral, Cape Verde, then Gran Canaria, Canary Islands, Malaga, Spain; then Luqa, Malta. Beyond that, the route is unconfirmed.

Embraer had announced a contract for the six aircraft on November 30, 2017. The first aircraft had begun flight testing in November 2019 and deliveries were due to begin at the end of February but the COVID-19 pandemic delayed this by several months. They will be used by the PAF in the counter insurgency, close air support, light attack, air-to-air interception and surveillance roles.

OGMA overhauls Pakistan Navy P-3C Orion

PORTUGUESE AVIATION engineering company, OGMA, announced on August 17 that it had completed an overhaul of a Pakistan Naval Aviation Lockheed P-3C Orion. The company said the aircraft left its facility at Alverca, Portugal, on August 15 after completing a phase one, two and three periodic depot maintenance inspection and a phase A, B and C inspection. It was repainted before being returned to Pakistan to re-enter service.

AW109E hovers over Philippine Navy BRP *Jose Rizal* flight deck

Above: ***Philippine Navy Agusta Westland AW109E Power, serial number 435, hovers over the flight deck of Philippine Navy frigate BRP Jose Rizal (FF-150) while taking part in Exercise Rim of the Pacific (RIMPAC) 2020. The AW109E is a relatively recent addition to the Philippine Navy inventory, six being delivered between December 2013 and January 2015 for operation by Naval Air Squadron MUH-40 at Danilo Atienza Air Base, Cavite*** *Philippine Navy/SN1 Pataueg*

RAAF F-35A to train at Evans Head

Stealth and speed: the Lightning II soars above EVDAWR in New South Wales. *Sgt David Gibbs*

A Royal Australian Air Force (RAAF) F-35A Lightning II flies over the Evans Head Air Weapons Range (EVDAWR) in Northern New South Wales. An RAAF review of the range has determined that EVDAWR is suitable as a practice area for the F-35A. Squadron aircrew plan to use the range for bombing training for the Lightning in the same manner as the Boeing F/A-18F Super Hornet has been. On August 19, an F-35A conducted sorties over the range prior to releasing a 500lb (226kg) inert bomb. Further trials are expected in November.

Blackjack eyes skies Down Under

A UNITED States Marine Corps Boeing Insitu RQ-21A Blackjack was flown for the first time in Australia at Bradshaw Field Training Area, as part of the annual marine rotational force.

The RQ-21 tactical unmanned aircraft system (UAS) can be rapidly deployed with a limited personnel footprint and provide route reconnaissance, target confirmation or intelligence collection. The UAS can be operated on a hub and spoke approach: a base, the hub, will allow the RQ-21 to be launched from the back of a distant ground vehicle, the spoke; extending the range of the aircraft up to 150 nautical miles (278km) from the hub.

At the Bradshaw Field Training Area, Marine Unmanned Aerial Vehicle Squadron 3 (VMU-3), the Marine Rotational Force – Darwin (MRF-D) air combat element, launched the RQ-21.

"We're able to be that eye in the sky for long periods of time, providing battlefield situational awareness, pattern of life, whatever our joint force commander is looking for," said VMU-3 unmanned aircraft systems officer, 1stLt Trevor Ellingson. He added: "This is the RQ-21A's first deployment since we declared the squadron [fully operational]."

In a real-world mission, the RQ-21 teams would be deployed within striking distance of adversaries. These small teams would provide specific mission-tailored capabilities for the follow-on, larger naval forces.

During a timed training event, the MRF-D Marines were challenged to deploy from the hub location and establish a spoke site. All the necessary equipment for the spoke was fitted into two AM General High-Mobility Multipurpose Wheeled Vehicles.

VMU-3 is based at MCB Hawaii, Kaneohe Bay.

US Marines conduct pre-flight checks on the Boeing Insitu RQ-21A Blackjack at Bradshaw Field Training Area in Northern Territory, Australia, on August 9, 2020 *Cpl. Harrison Rakhshani*

When worlds collide

In this exclusive interview, professor Ismail Demir, head of Turkey's F-35 programme, tells **Rob Coppinger** that recent actions by the US government are not based in law

Turkey's first serial production Lockheed Martin F-35A Lightning II flies. Henry Ham

Is it Turkish government policy to be involved in the F-35 Joint Strike Fighter programme?
Turkey is still officially a partner in the F-35 programme and has no intention to withdraw. Turkey is in favour of engaging in the consultation process to find a mutually acceptable way forward in accordance with the [programme's] production, sustainment and follow-on development memorandum of understanding.

What formal notification has Turkey received about its status in the F-35 programme?
As of [August] we have not received any formal notification that Turkey has been removed from the programme. There has been formal correspondence, both in written and oral forms, between the US government and Turkey. The US suspended the shipment of F-35 equipment with the NDAA 2019 [National Defense Authorization Act fiscal year 2019] as a first step. The US declared a unilateral plan on June 6, 2019, followed by a decision to suspend and formally remove Turkey from the programme, which was announced on July 17, 2019. The access of Turkish personnel to the project office has been terminated, Turkish participation in the programmatic management activities has ceased, the transfer of all information relating to the programme and F-35-related material [and] equipment has been suspended. The training of Turkish pilots and maintenance personnel has been stopped and all trainees have returned to Turkey. Our access to the four Turkish F-35 aircraft has been terminated and these aircraft have been stored in [America] under US custody since then.

What is Turkey's response to the reasons given by the US government for the country's alleged removal from the F-35 programme?
The US government is alleging [that] Turkey's acceptance of the S-400 system is a material breach of essential security-related provisions of the Production, Sustainment and Follow-On Development (PSFD) Memorandum Of Understanding (MOU). [The] PSFD MOU does not... implicitly refer to any provision on removal of a party from the F-35 programme without its consent. Therefore, actions to purportedly remove Turkey from the F-35 programme taken by the US government unilaterally, including suspension from the programme, has no legal basis. Turkey has secured all the information of the F-35 programme in compliance with the PSFD MOU and has taken all necessary precautions against all foreseeable risks. In order to address the unilateral concerns of the US and to identify security concerns, defence needs and technical mitigation measures, Turkey has proposed to conduct a joint study in the defence and security working group. However, despite Turkey's numerous requests, including reasoning, legal basis and reassurances regarding concerns that the F-35 stealth technology would be compromised, the US government has never addressed Turkey's request.

Turkey's F-35 Joint Strike Fighter history

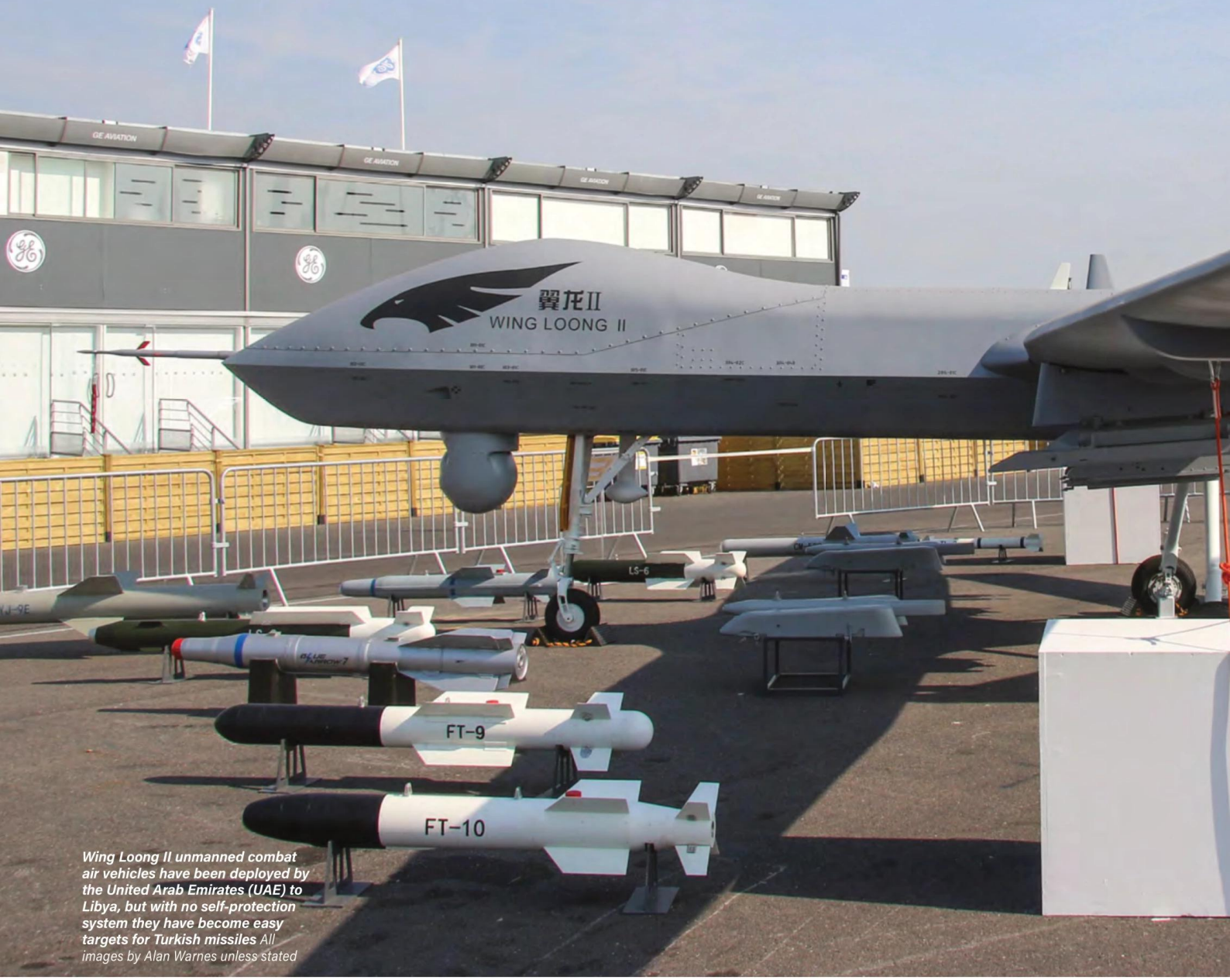
Turkey has declared that it intends to purchase 100 Lockheed Martin F-35A Lightning II aircraft, the conventional take-off and landing version. It had placed firm orders for 30 aircraft. The Presidency of Defense Industries (SSB) oversees Turkish participation in the F-35 Joint Strike Fighter programme and is also the procurement agency for defence and security equipment. Turkey has participated in the JSF programme since the concept demonstration phase, which began in late 1996, and signed the Production, Sustainment and Follow-On Development Memorandum of Understanding in 2007, and it has contributed $1.4bn including the value of its internal spending. The country also provided personnel to the JSF Program Office. The SSB is in charge of Turkey's F-35 programme participation and the S-400 Russian SAM system's procurement.

Who is Professor Ismail Demir?

Professor Ismail Demir is the president of Defence Industries, which is part of the Presidency of the Republic of Turkey, the executive department of the Turkish government. In April 2014, he was appointed as the head of the Undersecretariat of Defence Industries, which was affiliated to the Presidency of Republic in December 2017. It was subsequently renamed the Presidency of Defence Industries (SSB) in July 2018. Professor Demir graduated from Istanbul Technical University as an aircraft engineer and has received masters' degrees from the University of Michigan and Purdue University. His engineering doctorate is from Washington State University.

Libya spirals into chaos

The ongoing Libyan civil war has had many defining flashpoints, but, with foreign interference increasing, the prospect of a united Libya looks bleak, as **Alan Warnes** reports



Wing Loong II unmanned combat air vehicles have been deployed by the United Arab Emirates (UAE) to Libya, but with no self-protection system they have become easy targets for Turkish missiles *All images by Alan Warnes unless stated*

'Essentially, a two-tier war is being fought in Libya – a low-tech one and a high-tech one'

In mid-May, NATO Secretary General Jens Stoltenberg told Libya's Government of National Accord (GNA) Prime Minister, Fayez-al Sarraj, that NATO was still backing him. Although the GNA's governance expired on December 17, 2017, two years after it was elected into power, Stoltenberg told Sarraj that NATO would follow the path set out by the United Nations Security Council under Resolution 2510. In other words, stabilising Libya was its key objective, but other than warning countries like Turkey – a NATO member – and Russia not to interfere, there was little else of substance to his words.

NATO's conveyed support came on the back of renewed violence between the Tripoli-based GNA and General Khalifa Haftar's Libya National Army (LNA), headquartered in Benghazi. Hafter, a former CIA agent exiled during Colonel Gaddafi's rule, obtained US citizenship in the 1990s. He returned to Libya in 2011, keen to seize Tripoli by force, then take over the country. For a while, he appeared to be achieving that goal.

Turkey intervenes

The course of the Libyan conflict changed after Turkish President Recep Tayyip Erdoğan intervened in January, after the GNA lost ground to the LNA. His intervention mirrored the moves of Russian President, Vladimir Putin, when his military were sent to Syria in 2015, just as President Assad's war effort was flagging.

A security consultant specialising in air defence, who did not want to be identified, spoke to *AirForces Monthly* about Turkey's role in recent months: "They managed to alter the conflict's outcome because they introduced anti access area denial (A2AD) systems. Introducing them into the battlefield has been paramount to the type of operation being fought there."

Turkey has been keen to establish air defence umbrellas, first around Tripoli, to restrict the freedom of the LNA's Chinese-designed Wing Loong II drones over the Libyan capital's airspace, and then other strategic areas. They created a network of systems including the medium-range Raytheon MIM-23 Hawk ▶

Turkey's role

Turkey has openly supported the GNA in Libya. Its support comes not through deploying conventional forces, but with units on the ground providing training and operational support. Initially, armed Bayraktar TB2 UASs played a significant air support role by attacking strategic and tactical targets. Turkey also hired (and then transported) fighters from the Turkish-backed Syrian National Army to Libya, in Airbus A400M and Lockheed C-130E Hercules, to bolster GNA troops.

Turkish Navy frigates have been fitted with the Thales SMART S Mk2 3D multibeam radar and are being used as part of an impressive anti-access area denial (A2AD) system. The A2AD is seen here on The Royal Danish Navy's HDMS Absalon (L-16) support ship Thales

surface-to-air missile (SAM) system, shorter-range Hisar-A SAM system and Korkut anti-aircraft guns to protect high value assets that could shoot down the Wing Loong IIs.

The Turkish Navy, using ex-Oliver Hazard Perry frigates, arrived off Libya's coast to act as mobile A2AD systems along the coastline. They have been very effective working against the drones operating over the towns of Sorman and Sabratha, in the fighting to the west of Tripoli. These frigates are former US Navy vessels that have also been comprehensively upgraded by Turkey's Havelsan systems company. The Turkish Navy now refers to them as Gabya-class frigates.

They house a new vertical launching system to accommodate Sikorsky S-70B Seahawks, regularly seen flying along Libya's coastline. Another major modification is the 250km-range Thales SMART S Mk2 3D multibeam radar, operating in S-band optimised for medium-to-long-range surveillance and target designation in littoral environments. The system specialises in littoral warfare detecting small surface targets, helicopters and anti-ship missiles.

On board, the radar combines with the RIM-66E standard medium range SAM or the RIM-162 Evolved Sea Sparrow missile (ESSM) to provide a deadly response. Their 60km range is very similar to the MIM-23 Hawks but, when mounted on the frigates moving along coastal waters to defend Tripoli and other northern areas, they are a flexible threat.

Tactics to target the LNA's Wing Loong IIs have worked well. Several drones have been shot down – they don't have jamming or self-protection systems on board. Ironically, the Wing Loong IIs are fitted with Thales satcom systems, which the Thales SMART S Mk2 radars helped to shoot down.

Simply put, the drones could not work efficiently in the areas covered by Turkish air defences. "This was a big game changer," said the security consultant. "The Emirati-backed LNA will now have to develop complex counter-A2AD operations for which they have never been trained."

Emirati limitations

This highlights the United Arab Emirates' (UAE's) difficulties if it was ever to face Iran (one of its biggest threats), which has very powerful integrated A2AD systems. The LNA and GNA both lacked much-needed Intelligence Surveillance and Reconnaissance (ISR) systems to manage their battle space.

Turkey's Bayraktar TB2 has proved formidable against the Libya National Army (LNA) since being introduced into service in Libya three years ago

Our anonymous source commented: "Forces on the ground should be monitored through passive and active, large-field-of-view communications intelligence (COMINT) and synthetic aperture radar-ground moving target indication (SAR-GMTI) airborne sensors, and develop a capability to anticipate each other's moves."

Essentially, a two-tier war is being fought: a low-tech one between the LNA and GNA involving attrition-style, on-the-ground combat with rifles and explosives, and a high-tech one fought in the air, sea and RF (radio frequency) spectrum, executed by their respective foreign allies.

The result has been the total collapse of the LNA's western front, because the Emiratis could not defend it using their old Wing

Above: Raytheon MIM-23 surface-to-air missiles have been deployed by the Turkish military to provide air defence umbrellas around strategic locations in Libya
Left: Another type of drone operated by Turkey in Libya is the Anka S, which has a SATCOM fitted inside the nose. It has a maximum range of up to 1,000km and is regularly used by the Turkish Navy in a maritime patrol role

Loong IIs and Pantsir S1 SAMs. Turkey has also adopted a different approach to the conflict compared to the UAE's co-operation with the LNA. The Turkish train the GNA to operate the Bayraktar TB-2 and Anka-S drones, while the UAE's Wing Loong IIs are under strict Emirati control.

The GNA uses the Turkish weapons autonomously, developing key capabilities and employing armed Bayraktar TB2 combat air vehicles – arguably the first militia to operate a drone in combat operations in Africa.

The TB2 also has an impressive COMINT intercept system, to manipulate and geo-locate all the LNA communications. With the LNA's fondness to chatter on their phones, radios and transceivers, the Turkish and the GNA know exactly where the action is and, with no Comsec (communications security), the LNA is disclosing its operations and being picked off.

While the LNA does have the UAE Pantsir S1s, which are useful when part of an integrated system, they were never designed to be operated in high-tempo ops in the manner the UAE uses them. As a result, they suffer from poor serviceability.

The Al-Watiya attack

When LNA-held Al Watiya air base, 140km southwest of Tripoli, was taken back by the GNA on May 18, the Turks had already placed one of their air-defence bubbles around the area. The previous day, one of their G-Class frigates had shot down a Wing Loong II drone using its RIM-66E missile system.

As the attack on Al Watiya unfolded, the UAE did not respond by sending Mirage 2000-9s from Egypt because they would come into the range of a MiM-23 or RIM missiles. It became obvious the UAE Air Force and Defence Force (UAEAF&AD) would have to adapt their tactics in a dangerously-congested air space.

The meeting between Stoltenberg and the Libyan Prime Minister came just over a week after GNA forces ousted Haftar's forces from al-Watiya. The base was regarded as a key facility for the LNA, which had captured it in August 2014, and was used by Haftar to launch operations in Libya's west. Haftar's commander at the base, Osama Meseik, was killed in the attack.

The re-taking of al-Watiya has further strengthened the GNA's hold on Tripoli, gaining the upper hand in the air superiority stakes. Turkish support for the GNA has played a key role in stemming the LNA offensive, with advanced air defences and drone attacks by Bayraktar TB2s targeting Haftar's troops.

Turkey goes defensive

Turkey has now established three military air bases – Misrata, Tripoli-Metiga, and now al-Watiya – guarded by Raytheon MIM-23 Hawk systems. However, al-Watiya came under attack again on July 5 by forces supporting the LNA. After a review of tactics and possibly introducing new weapons, UAEAF&AD Mirage 2000-9s are thought to have been sent to destroy the MiM-23s.

Sentinel-2 imagery posted on Twitter showed extensive damage to the southwest and southeast of the base, where the Hawk systems would probably have been located. Turkish news agency *Anadolu* quoted an unnamed Libyan Ministry of Defence official saying that there were no dead or injured in the attack, but that some of the equipment recently brought in to increase air defence capacity at the base had been

UAE Mirage 2000-9s are believed to have been used in the attack on Al Watiya air base on July 18, possibly supported by A330 MRTTs to refuel them

Right: It's possible the UAEAF&AD Mirage 2000-9s dropped the new Al Tariq Block 2 PGM, seen here with its wings extended at the Dubai Airshow in 2019 Below: Surveillance photos have indicated that Russia deployed 14 MiG-29 and Su-24 Fencers to Libya in mid-May, mainly as a show of strength, and to support Russian mercenaries on the ground if required *USAF AFRICOM*

damaged. The news agency also claimed Abdulmalik al-Medeni, a spokesman for the operation Rage Volcano conducted by the LNA, said the air attack was carried out by Mirage 2000-9s, based out of Sidi al-Barani air base, western Egypt, about 100km from the Libyan border. The Mirage 2000-9s probably used the UAE's own Al Tariq precision-guided munition, and possibly even the new Block 2.

At the Dubai Airshow in 2019, *AFM* was told by a spokesperson for technology group EDGE (which owns Al Tariq) that its enhanced version includes a navigation upgrade and range extension beyond the current 120km, thanks to the addition of a turbine propulsion system.

A retired Libyan army officer, speaking anonymously to *The Arab Weekly* newspaper, said al-Watiya was "hit by nine air strikes targeting the al-Nadab quarters, as well as Sungur air defence systems, fixed and mobile radar installations and a Koral signal jamming system."

The GNA, through its Deputy Defence Minister, Salah Al-Namroush, said it would respond to the offensive "at the right time and place", with both Egypt and the UAE now reasonable targets. Egypt has warned against any Turkish-backed effort to take the Libyan city of Sirte, which the LNA captured in January, saying it could result in its own army intervening. There have also been reports that the Turkey-backed GNA would attack Sirte and the Egyptian-controlled al-Jufra, Libya's largest air base.

Russian deployment

In yet another twist to this convoluted civil war, the Russians deployed 14 MiG-29 Fulcrums and Su-24 Fencers to Libya on May 26. The US Africa Command (USAFRICOM) was quick to announce their arrival, with an official press release stating that "Russian state-sponsored private military contractors (PMCs)" were "operating on the ground." The aircraft were deployed to al-Jufra to provide close air support to Russia's Wagner PMC Group operatives, supporting the LNA.

Wagner is owned by Yevgeny Prigozhin, a Russian oligarch with close ties to Vladimir Putin.

The aircraft were routed from Russia to Khmeimim air base in Syria in mid-May, where their markings were painted over before they arrived in Libya. "We know these fighters were not already in Libya and being repaired," said Col Chris Karns, director of USAFRICOM public affairs. "Clearly, they came from Russia."

The commander of USAFRICOM, Gen Stephen Townsend, said: "For too long, Russia has denied the full extent of its involvement in the ongoing Libyan conflict. We watched as Russia flew fourth-generation fighters to Libya every step of the way. Neither the LNA nor private military companies can arm, operate and sustain these fighters without state support – support they are getting from Russia."

Townsend observed that if long range A2AD capabilities were the next step, it would create real security concerns on Europe's southern flank. "Russia's sustained involvement in Libya increases the violence and delays a political solution," said USAFRICOM director of operations, Brig Gen Bradford Gering. "Russia continues to push for a strategic foothold on NATO's southern flank and this is at the expense of innocent Libyan lives."

The arrival of the Russian jets came as Haftar's LNA lost ground in the fight to take control of Tripoli, leading to a large number of the Wagner mercenaries fleeing the southern part of the city. Many headed to Bani Walid airport, where they were picked up by Russian aircraft and flown to Al-Jufra in the central region of Libya.

A UN report for the Libyan Sanctions Committee leaked earlier this year said Wagner operatives have been in Libya since 2018, with one of their roles being to provide electronic countermeasures expertise. No doubt there will be further defining moments in this civil war in the coming months and years. There are certainly no signs that Libya will be reunited anytime soon. AFM

Below: Turkish C-130E Hercules, as well as Airbus A400Ms, have been involved in transporting troops and equipment to their facilities in northwest Libya

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Corona C

A two-ship, consisting a Tornado IDS with RecceLite and a Tornado ECR with HARM missiles *Stefan Petersen*

Flying under conditions

How is the Luftwaffe's Tactical Air Force Wing 51 'Immelmann' operating in the COVID-19 crisis? Pretty well, it seems. Words & photos by ***Dr Stefan Petersen***

The ground crew sprints across the Tarmac from one Tornado to the other. The fighters are in the Last Chance Position, the final opportunity to make safety and readiness checks prior to take-off. They're wearing helmets and their mouths and noses are covered by masks with filtration systems. Probably because of Corona, you'd think. But, no. These crews have to wear their protective gear every day at work, as they move between the aircraft with their powerful engines running. These jets emit toxic exhaust fumes, so it turns out that breathing protection is an essential part of the job for these technicians.

While the masks aren't part of their Covid protection, the Luftwaffe's operations have certainly been affected massively by the virus. Here at Taktisches Luftwaffengeschwader 51 'Immelmann' (Tactical Air Force Wing 51 'I' – TaktLwG 51 'I') based at Schleswig-Jagel in Northern Germany, many operations and standard practices have been curtailed.

"Flying ops are limited," says Oberst (Colonel) Kristof Conrath, the Commanding Officer (CO) of the wing. "Shifts in the flying squadrons, as well as in the technical units, are separated in time and space. Personnel are working from their home offices as far as possible and, of course, mask-wearing is mandatory if they come here. Every measure that's instigated in civil life is used here, too. We do not want to become a new infection hot spot."

So far, there have been no coronavirus cases among the 1,800 wing personnel, reveals Conrath during our visit at the end of May. To maintain safety, officer and NCO clubs ▸

'Every measure that's instigated in civil life is used here, too. We do not want to become a new infection hot spot'

The Tornado's payload is clearly visible in this dramatic shot *Stefan Petersen*

have remained closed, along with the gym. "Masks are prescribed In the corridors of the buildings and also in staff cars if there is more than one occupant," adds the CO.

Of course, the medical centre is also on alert: "In the case of a suspected infection, the patient is isolated and taken to the doctor for testing."

Despite the virus, operations continue at a reasonable level, as the wing concentrates on its main tasks. "There's no standard military training like marches or exercises," reveals Conrath. "Pilots and Weapon System Officers (WSO's) only come to the base to fly, and they leave for home straight after that."

The crews have accepted the changes. "They're making the best of the situation. The 4th squadron has even had masks made with their insignia on," says the CO with a smile.

Combat mission training for the 1st and 2nd squadrons continues unimpaired, as the wing is assigned to the NATO Reaction Force (NRF) until the end of 2020, and also still operates with Heron 1 and its aerial photo evaluation unit in Mali and Afghanistan.

The 4th squadron – NATO code 514th Sqn – is the Tornado Operational Conversion Unit (OCU) established at TaktLwG 51 'I' three years ago.

In 2017, the Fliegerisches Ausbildungszentrum (Flying Training Centre) of the Luftwaffe at Holloman AFB in New Mexico/USA was disbanded and Tornado training was moved to Northern Germany (see *AirForces Monthly*, March 2018). The 1st squadron – 511th Sqn – flies the Tornado IDS (Interdiction/ Strike) with the Recce Lite Pod for aerial reconnaissance and the Tornado ECR (Electronic Combat Reconnaissance) in the SEAD (Suppression of Enemy Air Defences)

'They're making the best of the situation. The 4th squadron has even had masks made with their insignia on'

role. The 2nd squadron – 512th Sqn – is tasked with the operation of the UAV's (Unmanned Aerial Vehicles) – Heron 1 and Heron TP.

Aircraft maintenance, COVID style

The Luftwaffe's aircraft maintenance units concentrate exclusively on getting enough jets ready for flight.

"The personnel of each dock are merged into one working group and are on duty at a different times to the other groups, to take responsibility for a single aircraft," says Stabsfeldwebel (Warrant Officer) Jan Ingwersen, head of the planned maintenance section. "All guys who are at heightened risk from the corona infection due to illness stay at home anyway." This includes the four more elderly staff.

At the main maintenance hangar on the air base, a 'one-way system' has been established in the corridors. "There's one entrance and one exit, and everybody moves in one direction. This way, there are no unexpected encounters, and the prescribed 1.5m distance regulation can be adhered to," Ingwersen explains.

This is not always possible around the aircraft itself: "Some work requires more than two hands, so masks have to be worn by the technicians. Though that is not necessary when one guy's working at the nose of the jet and the other one at the tail."

Air traffic control (ATC), however, is explicitly excluded from the ▶

Commanding officer Oberst Kristof Conrath, with mouth/nose protection *Stefan Petersen*

A two-ship consisting of a Tornado IDS with RecceLite and a Tornado ECR with HARM missiles. Despite the limited flight operations during the coronavirus pandemic, combat mission training and the training of new crews has continued at TaktLwG 51 'I', based at Schleswig-Jagel *Stefan Petersen*

Oberstleutnant Bjoern Jansen conducting a video conference
Stefan Petersen

mask rules. Neither the tower, Ground Control Approach (GCA) or Aeronautical Information Service (AIS) personnel is allowed to wear face coverings, says Major Stephan Helms, the SATCO (Senior Air Traffic Control Officer) of TaktLwG 51 'I'.

"The risk that radio calls get obscured through the mask is too high," Helms explains. "The ATC personnel are, however, split into different groups, and schedules have been changed. There's no early and no late shift, only one single shift which lasts for nine hours. Of course, a break is necessary during this time. Afterwards, the air base is closed because, for 75 minutes, there is no tower and no radar control."

These changes are well co-ordinated with flying ops: "When the jets of the first round are back on the ground, we close the base. Then, before the second round takes off in the afternoon, we re-open."

'The five young pilots and WSOs get sufficient flying hours to finish the course on time, in spite of COVID-19'

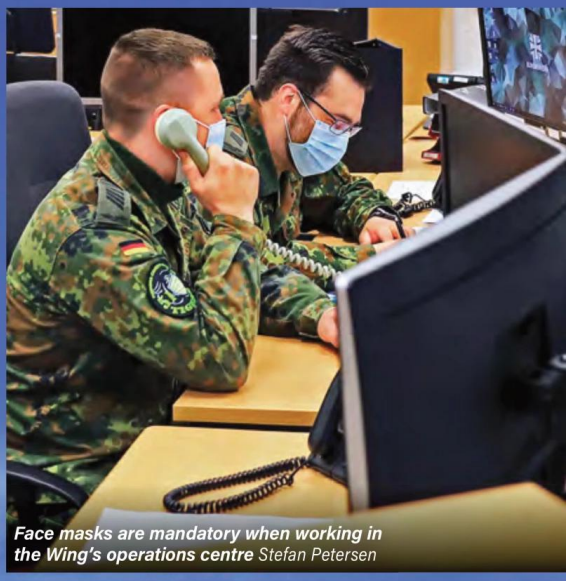
This is no problem for Oberstleutnant (Lieutenant-Colonel) Bjoern Jansen, deputy commander of the wing's Flying Group: "Of course, we fly less, though that's partly because of thinning out of the technical personnel. But we get enough flight time."

The recent B-Course 81 – the basic training for new Tornado crews – runs well under COVID-19 conditions. "The five young pilots and WSOs get sufficient flying hours to finish the course on time in spite of COVID-19," says Jansen, himself an experienced Tornado pilot. "The first two B-courses at Jagel – 79 and 80 – are completed, B-course 82 with three pilots and WSOs has begun, and 83 will commence in the autumn."

Meanwhile the training regime has settled down. "While the first B-course took twice as long as planned, we are now at a time factor of x1.5 of the Holloman curriculum," reveals Jansen.

In addition to all this flying time, one or two IP (Instructor Pilot) courses are conducted each year at Jagel.

Surprisingly, the coronavirus pandemic has also had a positive side effect for the wing. "Because we're flying less, the difficult 'spare parts' situation is relieved," admits Jansen. "Of course, that will revert back



Face masks are mandatory when working in the Wing's operations centre *Stefan Petersen*

Flying fewer missions due to the COVID-19 pandemic has had a few unexpected benefits. For one, reducing wear-and-tear on the aircraft has eased the number of spare parts required *Stefan Petersen*

Tactical Air Force Wing 51

Just another day at 'the office': a Tornado on a training sortie over Denmark *Stefan Petersen*

Two AGM-88 High-speed Anti-radiation Missiles (HARMs) are clearly visible underneath the fuselage of the Tornado ECR. These weapons are specifically designed to home in on the electronic transmissions from surface-to-air radar systems Stefan Petersen

'We do not underestimate the fact that it will be very, very expensive to keep the Tornado in the air in the long term. Many parts have to be remanufactured in small batch production'

as soon as flying operations get back to 100%. We do not underestimate the fact that it will be very, very expensive to keep the Tornado in the air in the long term. Many parts have to be remanufactured in small batch production."

However, some savings could be made in another way. "Due to COVID-19, we have been forced to conduct video conferences, not only within the wing itself, but also with other staff all over Germany," explains Jansen. "That has proved effective. I guess that, after the crisis, we won't go back to long-distance, time-consuming journeys for every conference."

Wing personnel who are having to work from home are connected by a special communications software via the internet, which allows them to access all of the data necessary for their jobs. "For secret data we even have our own secured system," Jansen says.

The working practices of the wing that have evolved with the COVID-19 situation have become the 'new normal' and are working relatively smoothly. In some respects they're even better, just like organisations in civil life.

This is the new benchmark for the military, says Oberst Conrath: "We look at what happens outside and we adapt." AFM

If there's more than one Luftwaffe technician working on a Tornado at any given time, then the wearing of face masks is mandatory, because keeping the prescribed distance of 1.50m is sometimes impossible Stefan Petersen

Gripen stuff!

Despite torrid political shenanigans, the South African National Defence Force (SANDF) can still put on a show. Photography by **Malcolm Reid**

SAAB Gripens during the SANDF Armed Forces Day flypast. Tail numbers are 3909 (Gripen D) and 3917 and 3924 (Gripen C). The type is based at AFB Makhado in the north east of the country and is operated by 2 Squadron 'Flying Cheetahs'. The South African Air Force (SAAF) operates nine Gripen Ds and 17 Gripen Cs

Lockheed C-130BZ Hercules, tail number 401, departing AFB Ysterplaat, Cape Town. The SAAF recently suffered a hull loss in January 2020 at Goma, in the Democratic Republic of Congo, when #403 ran off the runway while landing in wet conditions. The C-130BZ is operated by 28 Squadron, based at AFB Waterkloof, near Pretoria

Denel (Atlas) Oryx, tail number 1202, with the South African national flag while participating in the SANDF annual Armed Forces Day flypast on February 21, 2019. The Oryx is a development of the SA330 Puma with Super Puma dynamic components. This example is fitted with flotation gear, indicating that it is likely operated by 22 Squadron located at AFB Ysterplaat, Cape Town. Oryx helicopters are flown by several other squadrons located at various air bases around the country

BAE Hawk Mk 120 operated by 85 Combat Flying School, located at AFB Makhado along with the Gripen C/D. Tail numbers are 259, 260 and 263. The SAAF procured 24 Hawk Mk 120s primarily for the Lead In Fighter Training (LIFT) role

Super Lynx 300, tail number 191, is one of four Super Lynx helicopters operated by the SAAF but carrying South Africa Navy titles. They were procured to be deployed aboard the navy's four Meko Class frigates and are operated by 22 Squadron, located at AFB Ysterplaat. They are regularly seen in the skies over the Western Cape

Douglas C-47TP Turbo Dak, tail number 6825, seen returning from a maritime patrol to its AFB Ysterplaat base where it is operated by 35 Squadron. Originally a C-47 (c/n 12160) with the USAAF registration 42-92367, this example is 78-years-old. It was delivered to the SAAF in 1944. In the 1990s, the SAAF converted a large number of C-47s to TP status, lengthening the fuselages and installing P&W PT6 turbines

CASA C-212 Aviocar, tail number 8011, leading Beech B200 Super King Air, tail number 650. The Aviocar is operated by 44 Squadron and the B200 by 41 Squadron. Both are defined as 'light transport' squadrons, and they reside at AFB Waterkloof

Denel Rooivalk ('Red Hawk'), tail number 670, seen in action during a capability demonstration in Cape Town on February 21, 2019. It is equipped with two rocket pods and a 20mm nose canon. The white colour scheme is for aircraft used to support UN operations in Africa. The Rooivalk is operated by 16 Squadron located at AFB Bloemspruit in Free State province

Pilatus PC.7 Mk II Astras from the Central Flying School based at AFB Langebaanweg in the Western Cape. Tail numbers are 2004, 2011, 2051, 2052 and 2060

SAAB Gripen D #3901 doing a quick flypast over Cape Town. The type is operated by 2 Squadron based at AFB Makhado. This Gripen has been assigned to the Test Flight and Development Centre at AFB Overberg in the Southern Cape

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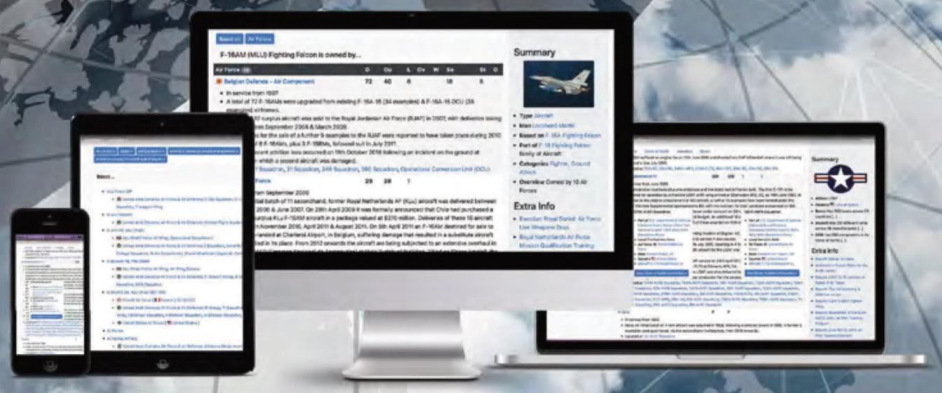

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Special Forces	☐	☐	☐	☐
Electronic warfare systems	☐	☐	☐	☐

How interested are you in military aviation in the following regions:

	No interest	*A little interest*	*Quite interested*	*Very interested*
UK	☐	☐	☐	☐
Europe	☐	☐	☐	☐
North America	☐	☐	☐	☐
Africa	☐	☐	☐	☐
Middle East	☐	☐	☐	☐
India/Pakistan	☐	☐	☐	☐
Asia/Pacific	☐	☐	☐	☐
Russia/CIS	☐	☐	☐	☐
Australasia	☐	☐	☐	☐
South America	☐	☐	☐	☐

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- ☐ Never
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	No interest	*A little interest*	*Quite interested*	*Very interested*
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Video	☐	☐	☐	☐
Aviation insight: strategy, politics, etc	☐	☐	☐	☐
Aircraft reports	☐	☐	☐	☐
Exercise reports	☐	☐	☐	☐
Interviews	☐	☐	☐	☐
Real-life aviation stories/'adventures'	☐	☐	☐	☐
Attrition	☐	☐	☐	☐
Aircraft IDs/plane-spotting info	☐	☐	☐	☐
Force/Wing/Squadron reports	☐	☐	☐	☐
Future aviation technology	☐	☐	☐	☐
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Mighty

The new-generation* Midas *tankers are based on the airframe, powerplant and systems of the vastly-improved Il-76MD-90A military transport *Ilyushin*

The Russian military is growing its offensive air capabilities at a relatively fast pace but, despite the mass fielding of new tactical combat aircraft and the wide-ranging upgrades of its long-range bomber fleet, it has so far proved ill-suited to providing reliable air refuelling support. The chief reason for the failure is the rather small fleet of existing tankers, combined with the slow-going development and testing of the new-generation Ilyushin Il-78 refuelling tanker (NATO reporting name *Midas*).

When developed and tested in the early 1980s, the sole purpose of the new Il-76-based tanker was to extend the range of the Soviet Union's huge fleet of strategic bombers, replacing the Myasishchev M3S2 and 3MN2 that had been reconfigured to serve as makeshift tankers. The Il-78 prototype, converted from a production-standard Il-76MD airframe and wearing the pseudo-civil registration CCCP-76556, made its maiden flight on June 26, 1983.

The new tanker was launched into production at the Tashkent Aircraft Production Enterprise (now Tashkent Mechanical Plant) in Uzbekistan that same year, with the first deliveries reported in 1984. The initial five production-standard aircraft went on to serve in an aircrew training role with the Ivanovo-based training centre of the Soviet Air Force's Military Transport Aviation arm in 1984-1985. Later, these examples were handed over to the 409th APSZ (Tanker Aircraft Aviation Regiment) stationed at Uzin, in Ukraine.

As many as 23 Il-78s were eventually taken on by the regiment in Uzin, equipping its three component squadrons. The second unit to convert to the *Midas* was the 1230th Guards APSZ, stationed at Engels, in southeastern Russia. It took on its first aircraft in 1989 and soon afterwards began fielding the improved Il-78M derivative.

The 'vanilla' Il-78 had a 190,000kg maximum take-off weight (MTOW) and featured a fully-convertible cargo hold configuration. Fuel was contained in a pair of removable 14,000kg cylindrical fuel tanks inside the cargo hold. Together with the fuel in the spacious wing torsion box, the total capacity reached 92,800kg. At a range of 1,000km from its base, the Il-78 could transfer up to 65,000kg of kerosene to other aircraft, whereas at 2,500km the offloaded fuel dropped to 36,000kg.

Midas

The Ilyushin Il-78 tanker is one of the Russian Air Force's high-value assets. ***Alexander Mladenov*** *explores the refueller's origins, and details the latest 'Midas' incarnation, dubbed the Il-78M-90A*

'The Midas can deliver military troops or cargo to paved or unpaved airstrips in extreme environmental conditions'

The Il-78M-90A seen here during its first flight on January 25, 2018 *Ilyushin*

Above: ***The new-generation Midas comes equipped with missile-approach warning systems, as well as under-belly, laser-based countermeasures pod and dispensers to enable operations in high-risk situations*** *Ilyushin*
Below: ***The Il-78M-90A tanker can safely operate from paved and unpaved runways, and use dirt, gravel or grass airstrips if necessary*** *Alexander Mladenov*

The aircraft came equipped with three Zvezda UPAZ-1 refuelling pods – two under the outer wings and the third on the port side of the rear fuselage. The tail pod, fitted to a horizontal pylon on the port side (at 3m from the centreline), was used to refuel large aircraft types.

The cargo hold retained the full ability to be converted into transport configuration following the removal of the two cylindrical tanks; it also featured a full set of cargo handling equipment. The Il-76's rear gun turret was modified into the flight refuelling observation station, and the aircraft's avionics suite was enhanced with the RSBN-7S Vstrecha tactical aid to navigation (TACAN) system to facilitate mutual detection between the tanker and receiver – needed for rendezvous in all-weather and day/night conditions. The tanker also featured a new fuel jettison capability and was provided with equipment to refuel up to four aircraft simultaneously on the ground.

Midas touch-ups

The Il-78M is a vastly-improved derivative of the baseline Il-76MD, boasting a non-convertible/non-pressurised cargo hold and an MTOW increased to 210,000kg; when operating from unprepared runways, its MTOW is restricted to 157,500kg. The improved tanker

Above: ***Production of the Il-78M-90A is expected to be launched in 2021 at the earliest, subject to satisfactory completion of the type's exhaustive testing efforts by the Russian Aerospace Forces (VKS)*** *UAC*

was outfitted with a strengthened wing and undercarriage, while all the cargo handling equipment was stripped out and the cargo doors faired over; the port entry door was also removed in an effort to reduce the airframe's structural weight by around 5,000kg.

A total of 138,000kg of fuel can be accommodated in the wing torsion box and two fuselage cylindrical tanks (each holding 16,000kg of kerosene), while the transferable fuel can hit 80,000kg. At a range of 1,800km from its departure airfield, the Il-78M can offload up to 65,000kg of kerosene, and about 35,000kg at 4,000km.

The Il-78M also introduced the improved Zvezda PAZ-1M unit with a higher transfer rate compared with that of the original UPAZ-1, a total of 2,900 litres per minute. The PAZ-1M pod was installed on a cranked pylon on the port side; this specific arrangement was chosen to lower as much as possible the mounting point of the pod. This design solution also lowered the drogue position by about 1m in order to move it away from fuselage-induced turbulence, providing a steadier platform for receiving aircraft.

The first prototype, wearing the pseudo-civil registration CCCP-76701, took its maiden flight on March 7, 1987. The enhanced *Midas* derivative was launched into series production at the end of that decade, with the last examples for the Soviet Air Force rolling off the line in 1991. The Il-78M service life was set at 35 years, 8,000 flight hours and 6,000 landings.

As many as 52 tankers of the Il-78 family were eventually produced between 1983 and ▸

UPAZ refuelling pods

The UPAZ-series of unified hose drum podded units was developed by Russian manufacturer NPP Zvezda, which is famed for its K-36 high-performance ejection seats. Development began in 1975 and the pods were launched into production in the early 1980s.

The original UPAZ-1 Sakhalin unit, as used on the Il-78 and Il-78M, features a 26m hose (52mm in diameter) fitted with a collapsible funnel-shaped drogue. The fuel transfer rate for tactical aircraft is set at 1,000 litres/min, and 2,200 litres/min for strategic bombers. The improved PAZ-1M pod, installed on the cranked-design fuselage pylon of the Il-78M, has an increased transfer rate of 2,900 litres/min

The UPAZ-1/PAZ-1M pod is a compact assembly, its nose cone is only 600mm in diameter. Power supply is provided by ram-air turbine with variable-pitch blades, which drives a centrifugal fuel-transfer pump and controls the extension and retraction of the hose. To provide safe conditions for the contact and fuel transfer, the hose features a constant-tension system for stable contacts. Fuel transfer is a largely automated process initiated by the contact between the probe and drogue and ending automatically when the preset quantity of fuel is offloaded to the receiver. It can also be shut off manually by the refuelling operator in the aircraft's rear cabin.

The UPAZ-1M is the latest pod offered by Zvezda for the new Midas derivatives, which features newly-added digital control and boasts an increased fuel transfer rate, reaching 3,000 litres/min.

Currently, front-line pilots flying new-generation tactical jets practise air refuelling operations from the* Midas *only once or twice a year *Andrey Zinchuk*

2006, including 32 'vanilla' Il-78s, followed by 13 more improved Il-78Ms. About 40 of these were taken by the Soviet Air Force and three more examples are believed to have remained under the ownership of the Ministry of Aviation Industry, to be operated by the Ilyushin design bureau for various trials programmes.

One Il-78E, the dedicated export derivative of the Il-78M, developed in the late 1980s, was sold to Libya in 1991 to support operations of its newly acquired Su-24MK *Fencer-D* bombers. The Indian Air Force (IAF) then took delivery of a batch of six newly built Il-78MKIs between 2003-2006. The IAF *Midas* fleet, operated by No 78 Squadron, was modified to use Israeli-supplied removable hose drum pod units with drogues suitable for offloading fuel to both Russian- and French-made tactical aircraft in the IAF fleet.

The post-Soviet era

After the Soviet Union's abrupt dissolution in December 1991, the 409th APSZ was inherited by the air arm of the former Soviet republic of Ukraine. The little-used fleet of 23 Il-78s, however, was no longer needed for their original business and the aircraft were soon converted into transports. Since 1993, the Ukrainian Il-78s have been used for commercial air transport work worldwide to ferry goods and fuel; some were even leased out to various local airlines for commercial air transport operations.

A sizeable number of Il-78s were sold outright to foreign military and civil customers.

The Ukrainian air arm eventually retained

Above: The VKS is short of tanker capacity and will see only a moderate expansion in the foreseeable future, relying mainly on newly built Il-78M-90As, and complemented by upgraded Il-78-2s *Alexander Mladenov*
Below: The Il-76MD-90 airlifter and its tanker derivative, the Il-78M-90A, share the same cockpit with multi-functional displays. They come outfitted with the eight-display KSEIS glass cockpit system, shown here in an engineering simulator *Alexander Mladenov*

Since the early 2010s, the tiny* Midas *fleet has been regularly called on to offload fuel to the Russian tactical aircraft force, operated by both the VKS and the Naval Aviation branch *Andrey Zinchuk*

a fleet of six to eight Il-78s, most being kept in long-term storage or used as spare parts sources. A few were even scrapped. Two Il-78s were sold on to a civilian customer in the United States (North American Tactical Aviation) but only one was eventually delivered in 2006. The second example remains stored in Ukraine.

In 1999, six ex-Ukrainian Il-78s were sold to Algeria to be operated by the country's air arm in their original tanker role, while another example was delivered to Angola in 2001 for use as a demilitarised cargo aircraft.

In the late 2000s, Ukraine also managed to sell four refurbished *Midas* tankers to Pakistan. Known as the Il-76MP, these aircraft, using original Il-78 airframes, were delivered to the Pakistan Air Force between 2009 and 2011.

Finally, three ex-Ukrainian Il-78s found a new life with the Chinese military following refurbishment, in a contract valued at $44.8m, with their delivery reported to have taken place between 2014 and 2016.

Meanwhile, the 1230th APSZ was inherited by the Russian Air Force. The unit received a new designation, the 203rd APSZ, in 1994, and six years later moved from Engels to Ryazan-Dyagilevo airfield, south of Moscow. In 2008, the *Midas* unit was again cycled through a reform – this time becoming a component unit of the 43rd Combat Training and Aircrew Conversion Centre.

In December 2013, the sole tanker unit of the Russian air arm, stationed at Ryazan-Dyagilevo, returned to the designation it had between 1994 and 2008. Known again as the 203rd APSZ, it reports directly to the Moscow-based Long-Range Aviation Command. According to the state-owned Zvezda TV channel, in mid-2018 the Russian Aerospace Forces (VKS) had a fleet of ten Il-78Ms and five Il-78s in squadron service.

Enhanced performance

The first Il-78M-90A tanker built at Aviastar-SP in Ulyanovsk, in southeastern Russia, was based on the Il-76MD-90A enhanced military airlifter and rolled out on November 29, 2017. Wearing the Russian state aircraft registration RF-78741, it first flew on January 25, 2018. The completion of the factory flight test programme would then pave the way for far more sophisticated flight testing undertaken by the VKS' 929nd State Flight Test Centre.

The new-generation VKS tanker, however, was known to have suffered from a protracted development. The sole prototype (c/n 02-01) entered production at Aviastar-SP in February 2015 and the original contract called for its first flight in early 2016, but the programme had a two-year delay.

The Russian air arm's needs were originally estimated at some 30 new-build tankers, set to complement the existing fleet of Il-78s and Il-78Ms – also slated to be cycled through an upgrade and service life extension programme – but a production order has yet to signed. Most likely, the eagerly expected deal is set to be inked upon the successful completion of the first Il-78M-90A flight test.

In fact, in August 2018, the Russian deputy defence minister, Alexey Krivoruchko, told the media that a long-term contract would cover only 14 Il-78M-90As, the last of which are slated for delivery to the

At a range of 1,800km from a departure airfield, the Il-78M can offload up to 65 tonnes of fuel *Andrey Zinchuk*

Slow-go upgrades

The Il-78-2 is an upgrade conceived for the existing VKS Midas fleet. The prototype aircraft, RF-94972 (c/n 79-05) reworked from an Il-78M, first took flight on September 26, 2019. In March 2020, it was still undergoing a preliminary testing phase undertaken by Ilyushin. Upon completion, it is set to be submitted to the VKS for a more rigorous flight-testing phase.

The Il-78-2's upgrade package is similar to the Il-76MD-M upgraded airlifter, with the avionics suite also reportedly being the same as the one used on the Il-78MD-90A.

The service life is extended to 40 years, enabling the existing VKS Midas fleet to remain in service until about 2030. Further life extension efforts to 45 or even 50 years cannot be ruled out, allowing the type to potentially remain in service until the early 2040s.

***Left:** A look inside the refueling operator's station in the Il-78M's tail* Zvezda TV

VKS by 2027. He also hinted the order may increase, but that the short-term goal was to get positive results from the type's flight-testing effort, to be initiated this year.

The Il-78M-90A retains the full transport capability of its predecessor Il-76MD-90A thanks to the convertible cargo hold provided with cargo handling equipment. The two removable tanks installed in the cargo hold can be rapidly replaced by the VAP-2 fire attack kit, containing 42 tons of water. The Il-78MK-90 is the Il-78M-90A's export derivative, which also retains the convertible cargo hold – but there have been no orders placed for it yet.

Powered by four Aviadvigatel PS-90A-76 turbofans, these two new-generation *Midas* derivatives boast strengthened fuselages and all-new avionics suites. Introducing the PS-90A-76 yielded a welcome saving in fuel consumption to extend its range, while the increased power rating afforded a faster rate of climb and much improved take-off performance. The new fuel-efficient engines offer some 10% lower fuel consumption and 18% longer range compared with the D-30KP-2-powered Il-78 and Il-78M.

The new tanker's maximum range is 5,000km with a 52,000kg payload, while the maximum payload is 60,000kg. Airframe design life is set at 30 years, 30,000 flight hours and 10,000 landings.

The PS-90A-76 turbofan granted the *Midas* a significant boost in take-off and landing performance, while also reducing the take-off run to 1,600m. Cruise thrust rating is 33.05kN, the engine's emergency thrust mode stands at 156.9kN, and the maximum thrust rating is 142.2kN.

The Il-78M-90A's avionics suite is based on the Il-76MD-90A's Kupol-III-76M integrated digital avionics suite, comprising the eight-display KSEIS glass cockpit, the SAU-1T-2B digital autopilot and the BPSN-2 satellite navigation system. The only additional avionics component, essential for the tanker role, is the proven RSBN-7S short-range aid to navigation with rendezvous mode.

The sophisticated Vitebsk-76 self-protection suite, borrowed from the Il-76MD-90A, is ▸

***Left:** The Il-78M is a non-convertible but more capable tanker derivative of the Il-76MD. It can accommodate 138,000kg of fuel in the wing torsion box and two fuselage cylindrical tanks* Alexander Mladenov

Above: ***A Su-34 bomber approaching the starboard pod drogue to take fuel from a VKS Il-78M*** *Andrey Zinchuk*

intended to counter infrared (IR) and radar-guided threats. It integrates a Pastel radar warning receiver (RWR), an Otklik laser warning receiver (LWR), and an ultraviolet (UV) missile approach warning system.

The aircraft also comes equipped with a single directional laser jammer installed in a pod under the fuselage to disrupt guidance systems of heat-seeking missiles launched against the aircraft, in addition, there are batteries of countermeasures dispensers for ejecting 50mm infrared flares and chaff rounds, housed in the main undercarriage nacelles. The aircraft features a nose-mounted electro-optical/infrared (EO/IR) sensor turret, also borrowed from the Il-76MD-90A, useful for landing approaches and low-altitude flight at night.

Beefed-up ability

Both the VKS and the proposed export versions of the new-generation *Midas* are advertised as being capable of carrying 87,600kg of fuel in the main wing torsion box tanks, while 35,100kg can be accommodated in its two cylindrical tanks, allowing a maximum fuel capacity of 122,700kg. At a range of 1,000km from departure, the transferable fuel is 75,000kg, dropping to 57,000kg at 2,000km and at 40,000kg at 3,000km. The new tanker can also offload to receivers up to 82,000kg when flying refuelling orbits next to its airfield of departure. Air-to-air refuelling operations can be performed at altitudes between 2,000 and 9,000m and at speeds of 440 to 600km/h.

The new *Midas* airframe and systems design features a high degree of redundancy needed for heavy-duty operations in hostile environments, in addition to comprehensive self-contained cargo handling equipment. In particular, the airframe structural design incorporates extensive high-lift devices, rugged landing gear and an auxiliary power unit.

According to manufacturer, Ilyushin, one advantage the *Midas* has over other modern tankers is the ability to deliver military troops or cargoes to paved or unpaved airstrips in extreme environmental conditions, where no ground support or navigation aids are available. It also retains full airdropping capability for both cargo and troops.

The spacious cargo hold can be converted to a specific mission configuration in under two hours, enabling the Midas to be used for transportation on an 'as-needed' basis for up to 225 troops seated on two decks, or 145 paratroops. The cargo hold also allows for the medical evacuation of up to 114 stretcher patients while providing medical treatment, including surgical service, during flight.

Over the next decade, the fielding of new Il-78-90As, and upgraded Il-78-2s, will provide the otherwise small VKS tanker fleet with a much-needed boost in serving the enhanced strategic and long-range bomber force. It will also beef up Russia's ability to 'project force' around the world, and its capability to strike against targets that are huge distances away. AFM

Above: ***A Su-30SM of the VKS Lipetsk combat training centre seen in contact with the drogue assembly of an UPAZ-1 pod*** *Andrey Zinchuk*
Below: ***This example, belonging to the 'Russkiye Vityazi' display team, is photographed taking fuel from a Midas over Lipetsk*** *Andrey Zinchuk*

Failed conversions

Russia's efforts to procure a pair of Ilyushin Il-96-400TZ long-range tanker/transport aircraft for the VKS collapsed in 2017, reportedly due to a failure to reach an agreement with the type's manufacturer, Ilyushin, on the scope of development and end price.

Two existing Il-96-400T cargo aircraft, built at VASO plant in Voronezh, were earmarked in 2013 for conversion into strategic tankers, supporting the worldwide operations of the Russian Tu-160 *Blackjack* and Tu-95MS *Bear-H* fleets. These four-engine jet freighters, operated between 2009-2011 by the now bankrupted Russian air operator Polet, were taken back by their owner, Ilyushin Finance Co (IFC) and, in January 2015, were contracted to be converted into tanker/transport aircraft for the VKS. The delivery deadline was set at November 2018.

During development, however, Ilyushin realised that the agreed price for the tanker conversion had been insufficient to cover all the military requirements in terms of newly installed mission equipment, testing and certification.

According to the Russian daily, *Izvestia*, Ilyushin offered a shortened and accelerated development, retrofit and testing programme for the Il-96-900TZs in an effort to reduce conversion costs. The Russian Ministry of Defence (MoD) was not happy with this proposal and eventually refused to accept it. As a result, the VKS lost the chance to get a new tanker that could carry considerably more fuel than the *Midas*, as well as cargo and personnel, which would have been well-suited to support the global patrol operations of the currently rejuvenated Tu-160 fleet.

Below: ***Two Il-96-400Ts, formerly flown by Russian air operator Polet, were contracted in 2015 to be converted into tankers for the VKS by Ilyushin. However, two years later the deal was terminated, apparently because the final price could not be agreed*** *Alexander Mladenov*

Watching the Watchkeepers

Once plagued by delays, rising costs and several high-profile crashes, the WK450 – the UK's first all-weather intelligence, target acquisition and reconnaissance drone – is enjoying a resurgence. ***Ian Harding*** *reports*

In service with the British Army, the Thales Watchkeeper WK450 is an unmanned aerial vehicle (UAV) used for intelligence, surveillance, target acquisition and reconnaissance (ISTAR). Developed and built under an £800m contract with UAS Tactical Systems (U-TacS), a joint venture between Elbit and Thales UK, Watchkeeper is currently operational with 47 Regiment Royal Artillery British Army from its new base at Ministry of Defence Boscombe Down, Wiltshire.

With its regimental headquarters located 8km away at Larkhill Garrison, 47 Regiment Royal Artillery is the only UK unit currently operating Watchkeeper. The regiment's exclusive responsibility at Boscombe Down broadly includes all aircraft and system operational force generation, pilot and engineering training. However, since September 2019, elements of the unit have also been deployed at Royal Air Force Akrotiri in Cyprus on Exercise Athena Rebus to conduct training in preparation for future operations.

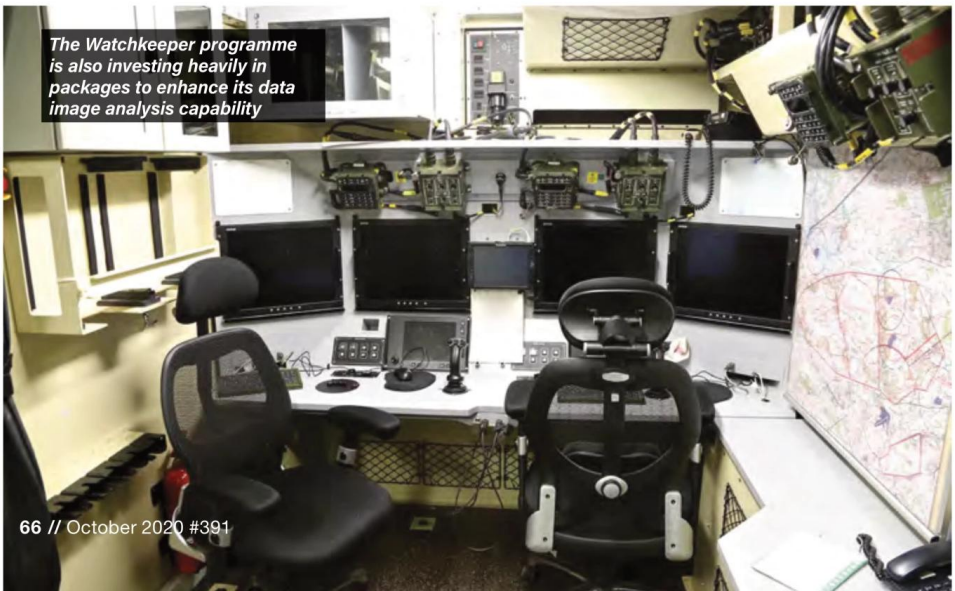
Blessed with suitable airspace, generally excellent weather and flying conditions, the Cyprus deployment has helped super-charge this key programme which many within British Army land forces consider to be its best ISTAR asset.

The British Army's Watchkeeper journey began on July 15, 2007, with the announcement that the UK would acquire 54 Watchkeepers for the British Army. With a unit cost of approximately £15m, this figure also included establishing the infrastructure necessary for 47 Regiment Royal Artillery to commence Watchkeeper operations from MoD Boscombe Down, to establish ground training facilities at both Boscombe Down (including simulators) and Larkhill, as well as the investment necessary to complete future development and testing of the air vehicle, its sensors and radars.

Watchkeeper completed its first UK flight on April 14, 2010, at Parc Aberporth in Wales (formerly RAF Aberporth) – the UK's purpose-built testing establishment for both military and commercial UAVs. It eventually received operational certification from the Military Aviation Authority (MAA) in March 2014, closely followed by the granting of its Release to Service (RTS). As a reflection

Personnel from 47 Regiment Royal Artillery are training hard to ensure Watchkeeper is ready to deploy on operations when requested

Since 2018, new operational flight testing and system development has moved forward at a pace, both in the UK and Cyprus



The Watchkeeper programme is also investing heavily in packages to enhance its data image analysis capability

Watchkeeper stats

- The Thales Watchkeeper WK450 is the first operationally proven Unmanned Aerial Vehicle (UAV) developed and built in the UK. It provides real-time, enhanced situational awareness for ground troops, while helping to reduce risk and loss of life.
- 54 Watchkeepers were ordered for the British Army in July 2007, of which 49 have been delivered to date.
- The Watchkeeper is a tactical system that will be operated in theatre by the British Army Royal Artillery, currently the 47 Regiment Royal Artillery.
- Based on the Elbit 450 Hermes tactical UAV, the primary difference is that Hermes is only fitted with an electro-optical/infrared sensor (EO/IR), while the WK450 has an additional dual-mode synthetic aperture radar (SAR). It also has a ground moving target indicator (GMTI) located within the I-Master radar, allowing it to see through all weather conditions.
- It can be deployed with NATO, European and US partners, and integrated with both the US network-centric warfare (US NCW) and the UK network-enabled capability (UK NEC).
- Power is provided by a two-bladed pusher rotary propeller.
- Maximum payload capacity is 150kg and includes day/night sensors, a laser designator and a synthetic aperture radar/ground moving target indicator (SAR/GMTI).
- A wide-band satellite link can be installed, providing extended range operation without deploying a separate radio relay aircraft.
- Two Watchkeepers can operate in tandem, with the second acting as a communications relay. The GCS is network enabled to ensure there are comprehensive communications links with airborne stand-off radar, attack aircraft and battlegroup headquarters.

of this progress, the MoD soon deployed an undisclosed number of Watchkeepers to Camp Bastion in Afghanistan between September and mid-October 2014 to provide British troop force protection.

Although brief, this deployment proved successful, with over 100 missions each lasting up to eight hours. Watchkeeper's value was well illustrated during one mission when an aircraft supported the US Marines by using its Ground Movement Terrain Indicator (GMTI) capable I-Master radar. The Watchkeeper then cued a Hermes 450 UAS onto to a target for continued tracking, which in turn forwarded information to a Royal Air Force MQ-9 Reaper to conduct an airstrike.

Huge setback

Air vehicle flight training continued unabated from this period, although it is generally acknowledged that, by the end of 2015, several factors, including bad weather, system issues and a lack of qualified pilots hindered programme development.

During 2017 and 2018, the loss of five Watchkeepers in the UK for various reasons in relatively quick succession proved a huge setback for the programme, especially with the negative publicity that ensued.

Following lengthy and extensive crash investigations, the Watchkeeper Force programme has progressed at a fast pace during the last 18 months – away from public scrutiny – under the stewardship of Colonel James Anderson, Watchkeeper Force Commander.

To consider the progress first-hand, *AirForces Monthly* was given access to 47 Regiment Royal Artillery's Boscombe Down facility, and its Force Commander prior to his retirement at the end of March 2020. During this period, Watchkeeper successfully achieved Full Operational Capability (FOC) on November 30, 2018. New pilots and engineers have qualified, and most importantly, operational flight testing and system development has moved forward both in the UK and Cyprus at pace.

At the time of writing, 47 Regiment Royal Artillery is established for 24 aircraft available for deployment, with a further 25 in storage at Royal Air Force Shawbury, Shropshire.

As a former British Army Westland Lynx pilot, Chief of Staff at the MAA, and Head of Safety and Assurance for the UK's Joint Helicopter Command (JHC), Col Anderson was uniquely qualified for the Watchkeeper programme at a difficult time. He took command of a professional force in late 2018 that already had considerable mini-UAV experience in the shape of the Lockheed Martin Desert Hawk III and others, plus a significant operational pedigree successfully flying the larger Hermes 450 (leased from Elbit Systems in 2007) in Afghanistan between 2007-2012.

Post Afghanistan, the Watchkeeper Force continued to generate and conduct training. This included a deployment to Ascension Island in the South Atlantic Ocean. System testing was of primary importance at this time, and it was during this period that a number of accidents occurred. Understandably, the trials programme was halted to enable crash investigations to be completed and recommendations were implemented.

Context is important when considering experimental trials work and next generation development of any air vehicle. While every accident is serious, they are not unexpected during this phase. The reality is that the British Army's confidence in the Watchkeeper system never wavered despite external uncertainty.

The push to recharge the programme soon followed, as Col Anderson explained: "As a consequence of the crash investigations, the mark of the aircraft was changed, and elements of its operating systems improved before the certification process was revisited. This culminated in RTS achievement on April 1, 2019. We were effectively in the foothills of redeveloping the force again; we had the experts in place, but we were light in terms of our familiarity with the equipment.

Two-pronged approach

"Once we had the ability to fly Watchkeeper again, we adopted a two-pronged approach aimed at maximising Watchkeeper potential as we moved into the winter months in the UK when low cloud, rain and poor visibility are problematic.

"Firstly, we developed flying capability from Boscombe Down; we were flying again by June 2018. Secondly, we developed an 'Assured Flying Location' at RAF Akrotiri as our winter-flying base with six aircraft deployed.

"From the outset, our focus was to rebuild instructor currency and to develop a strong instructor cohort. From two pilots at the start, we now have four military instructors, a number of U-TacS contracted instructors, plus over 20 qualified pilots. These numbers will grow rapidly. We now have our first Watchkeeper pilot training course underway in Cyprus. With this depth, we have now achieved a flying 'base standard' at both Boscombe Down and Cyprus, with the resources in place to deploy Watchkeeper operationally anywhere in the world."

Col Anderson says this is only one element of the system in its broadest sense. "We recognise that army personnel and those across the services now need to see how it flies, how intelligence is gathered, and how feeds are provided across domains," he explained. "In this respect we are working alongside Army Intelligence Corps image analysts to build capability and develop the required analytical skills. The critical next stage is integrating the Watchkeeper Force more broadly within the army, especially land force commanders, as this system will provide intelligence to aid their divisional fight. This process has formally commenced with up to four batteries (six Watchkeepers in each) assigned to the army's warfighting division and the Headquarter Battery working directly with the Divisional Information Manoeuvre Group (DIMG) to determine how we 'fight' Watchkeeper, gather information and deliver it in usable form to the division or whoever needs it."

According to Col Anderson, the regiment's deployment to Cyprus represented a critical stage in the programme's development. "Aircraft serviceability and availability is generally excellent, and with suitable

Watchkeeper is a remotely piloted information-gathering platform that represents a significant step forward in such technology for the British Army. The 47th Regiment Royal Artillery is the service's only regiment able to fly the Watchkeeper Tactical Unmanned Aerial System on long-range missions

These images were taken during a visit to the Watchkeeper Force base at MoD Boscombe Down, Salisbury, Wiltshire, just prior to the COVID-19 lockdown. Boscombe Down's future training infrastructure will include a full mission trainer (FMT) in addition to the emergency procedures trainer currently in place

weather conditions I can pretty much guarantee Watchkeeper can fly," he stated. "Having this resilience, coupled with a training programme which we didn't have previously, represented a huge step forward. With good weather windows, our engineers are currently delivering more aircraft than we have aircrew, but this will change.

"When we commenced flying in Cyprus in September 2019, our flying rates were low initially, but these have increased month-on-month as a consequence of our development. From the outset, we set achievable objectives in terms of the number of flights required each week. Whether we outperformed or not was primarily weather driven. Safety remained paramount and we tracked nicely with regards to flights.

"Our aim is always to maximise sortie efficiency and therefore we focused each on training, expanding crew numbers and maintaining crew currency. Having briefed the crew and set up the GCS (Ground Control Station), then prepared and moved the aircraft to the runway for departure (approximately 30 and 40 minutes each respectively), a typical mission would then involve flying the aircraft into segregated airspace out to sea to use its payload.

"This routinely comprised its EO (Electro Optical) and I-Master radar, and potentially other payloads in the future. The exciting part is that the system's capability exceeds what we are currently doing with it. In terms of firsts, I would say being deployed, achieving the longest flight at approximately nine hours (the aircraft's endurance exceeds 16+ hours), plus flying and controlling multiple aircraft from one GCS (each GCS has two to three pilots, subject to the mission). Whilst this can be achieved by a single operator, routinely we prefer to have a payload operator dedicated to controlling each aircraft's payload."

Col Anderson also confirmed the Watchkeeper Force is seeking to

Many within the British Army consider the Watchkeeper to be its best intelligence, surveillance, target acquisition and reconnaissance (ISTAR) asset

integrate on exercise with the division to participate in the divisional fight with peer/near peer warfighting.

"We are now considering how, having launched single or multiple aircraft, [they] can be transferred from one GCS to another closer to the forward troop line," he explained. "This extends our range which in turn enhances survivability. Watchkeeper provides critical mass in terms of numbers, which is of great benefit to an army land commander.

"Comparing our position in 2014 with that now, we are more developed, and I have far more confidence in the aircraft's capability. It will just improve the more we use it.

"The variety of work the aircraft is capable of is extensive, from pattern-of-life studies (GMTI) to warfighting. We have the mass if required, and the win for the army land commander, or whoever it is assigned to, is that they can have a dedicated platform."

Col Anderson added: "We now have 24 aircraft allocated to the forward fleet, and in theory we could deploy to the forward line with four batteries, each providing three task lines, each for 12 hours. These will provide hundreds of hours of surveillance capability and therefore intelligence which needs to be distilled into useful information. The skill is in doing so."

While the output from Cyprus around the end of 2019 helped recharge the programme, the focus on Boscombe Down's infrastructure was crucial for Watchkeeper's longer-term development. Aircrew and engineers moved from Larkhill, and the airfield's north/south runway (17/35) was redeveloped, enabling Watchkeeper to operate from it.

With the Salisbury Plain Training Area (SPTA) – the UK's largest military training area – just a few minutes' flight time from the airfield, Boscombe Down's real value is its close proximity to the land forces that will ultimately use Watchkeeper and the air-land integration that will ensue.

A key feature of Boscombe Down's future training infrastructure will be a full mission trainer (FMT) in addition to the emergency procedures trainer currently in place.

"Simulation will play an increasingly important part in future aircrew training, which will be enhanced at Boscombe Down when the FMT simulator is procured later this year," said Col Anderson.

"This will enable us to train the whole crew, increasing the level of granularity in simulation, especially with the regiment based at Larkhill and flying taking place at Boscombe Down."

According to the colonel, the benefits will be huge. "If a pilot is inside a GCS receiving an image, there is very little difference between this and flying the platform live.

"The simulator will eventually enable us to use simulation to run perhaps 80-90% of our currency flying training. This provides value for money and enables us to stretch the crews – dealing with emergencies and different operational scenarios – before the big push comes flying the aircraft on operations.

"In this respect, we need to display the aircraft's capability. This system can be deployed to the battlefield. The GCS is completely self-contained, with air-conditioning, chemical filters, and its own power supply. It can be moved and deployed rapidly. We are now getting to the position where we have generated sufficient capability and crews to practise this, and simulation will help."

Boscombe Down's development will hopefully see Watchkeeper supporting land forces on SPTA for the remainder of 2020, subject to the easing of COVID-19 restrictions. Col Anderson also confirmed that the British Army's wider use of simulation is aiding this process with Watchkeeper data feeds already represented in major exercises, such as the 'Warfighter' exercises aimed at developing core warfighting competencies.

This broadly mirrors manned aircraft pilot training, with pilots completing Conversion To Type (CTT), how to fly the aircraft, followed by Conversion To Role (CTR), how to fight the aircraft. CTT takes approximately six months during which time, pilots fly in the RAF's Grob G.115E Tutor (used by all three UK services) to obtain some elementary flight experience plus a sense of the environment, before completing similar manned flight ground training.

The force completed its first CTR course in the first quarter of 2020. During this phase, pilots worked with image analysts (and JTACs), learning to disseminate the data gathered, and then were taught how to distribute it. Once qualified, pilots will increase their flying experience either in the UK or by being deployed abroad.

Secure communications

Col Anderson confirmed that Watchkeeper operates its own secure encrypted links with the GCS. Secure communications into the battlespace are maintained using General Dynamics' Bowman, a tactical communications system that integrates digital voice and data technology to provide secure radio, telephone, intercom and tactical internet services within a modular and fully-integrated set-up.

The force is also investing heavily in packages to enhance its data image analysis capability, enabling images to be sent to (and analysed from) remote terminals. Connectivity, or 'teaming' with other air- and ground-borne assets, is another growth area for Watchkeeper, such as with the Desert Hawk III miniature UAV, AW159 Wildcat Battle Reconnaissance Helicopter and the Apache AH64.

The key is having the right modem for transmitting and receiving data and imagery across the communication channels securely. Watchkeeper has already been teamed successfully with Joint Terminal Attack Controllers (JTACS) in Afghanistan in 2014 and is doing so in Cyprus currently.

"With continued investment, I see the platform as being a workhorse, the real skill is in the payload, its exploitation and data dissemination," said Col Anderson. "The expected life span of the aircraft is 2042, and history tells us aircraft tend to extend beyond their out-of-service date."

GMTI has proved highly successful during successive British forces operations in Afghanistan and elsewhere. Watchkeeper's payload includes GMTI contained within its I-Master radar, and this will be supplemented by a maritime version (MMTI) going forward.

Col Anderson was also able to confirm that Watchkeeper is one of the lead systems to receive the military-only Mode 5 Identification Friend or Foe (IFF) functionality.

In terms of layered ISTAR, which is considered critical to future military operations supporting UK aircraft carrier

The Watchkeeper Force deployment to RAF Akrotiri, Cyprus, provided vital training for the pilots, ground crew and technicians who keep this highly advanced ISTAR asset in the skies

A Watchkeeper is moved to the flight line at RAF Akrotiri during Exercise Athena Rebus. Since arriving in Cyprus, Watchkeeper flying rates have increased month-on-month

Trials, flights, and deployments

- The first flight took place at Megiddo Airfield (known as Shachar 7 by the Israel Defence Forces), in Israel, in April 2008.
- Trials of Elbit's Magic X-band automatic take-off and landing system were completed in August 2008. Trials with the I-Master radar and EO/IR payloads were conducted in late 2008.
- Watchkeeper flight evaluation, completed in June 2009, enabled ground system and flight tests in the UK to commence. These trials then moved to Parc Aberporth, Wales, in late 2009.
- Its first UK flight took place on April 14, 2010, before entering UK service in 2011.

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operations, Watchkeeper will undoubtedly have a future role to play working alongside other UAVs, such as General Atomics MQ-9 Protector, as well as whichever system the Royal Navy eventually acquires to meet its specific maritime requirements.

The colonel described Watchkeeper as a high-end tactical UAS that tips into the Medium Altitude Long Endurance (MALE) category which has found global favour for its combined surveillance and strike capabilities.

So much potential

"We have learned a huge amount about the aircraft's payload and employment during the last 18 months, and future exercises and simulation will enhance this process further," he said.

"Presently, the aircraft's flight, payload operation and analysis, is solely reliant on the pilot and the image analyst located within the GCS. Artificial intelligence (AI) and machine learning will be hugely significant in the future.

"The thought process here is that AI could, in future, trigger its own searches, compare and contrast differences in past and present images, and draw an operator or another user's attention to it."

Given past history, there has been an understandable degree of defensiveness within the MoD and Watchkeeper Force, but the mood has changed.

The programme's journey over the past 18 months is positive and the whole force is rightly proud of their progress, effectively returning to the timeline it should have been tracking. However, everyone associated with Watchkeeper is acutely aware of the work necessary to rebuild external confidence.

"The force is biting at the bit to deploy on live operations, it just needs to do it," said Col Anderson. "That is when senior leadership will see what a truly special piece of kit Watchkeeper is; we'll be flying potentially 14-hour missions, gathering information and intelligence that will improve our ISTAR picture.

"This is why I assert that with two payloads currently – I-Master (GMTI) and EO/IR – Watchkeepers is the British Army's best ISTAR platform.

"We are ready to deploy with one sub-unit and crews on 20 days readiness, another on 30 days, and further units on 60 days readiness – albeit we still have to generate some of these crews. One sub-unit is very low risk for the force currently. It is feasible for us to move up the scale at present, but we know we still have work to do.

"With 24 aircraft in our forward fleet (the remaining 25 aircraft forming the sustainment fleet are retained at various levels of storage at RAF Shawbury), our frontline forward fleet provides four fighting batteries (six aircraft each). Each battery could provide up to 144 hours of surveillance over a 24-hour period assuming all aircraft are serviceable and operating efficiently."

But the most important message, according to Col Anderson, is that the Watchkeepers Force has turned the corner, is looking forward, and is ready to deploy. AFM

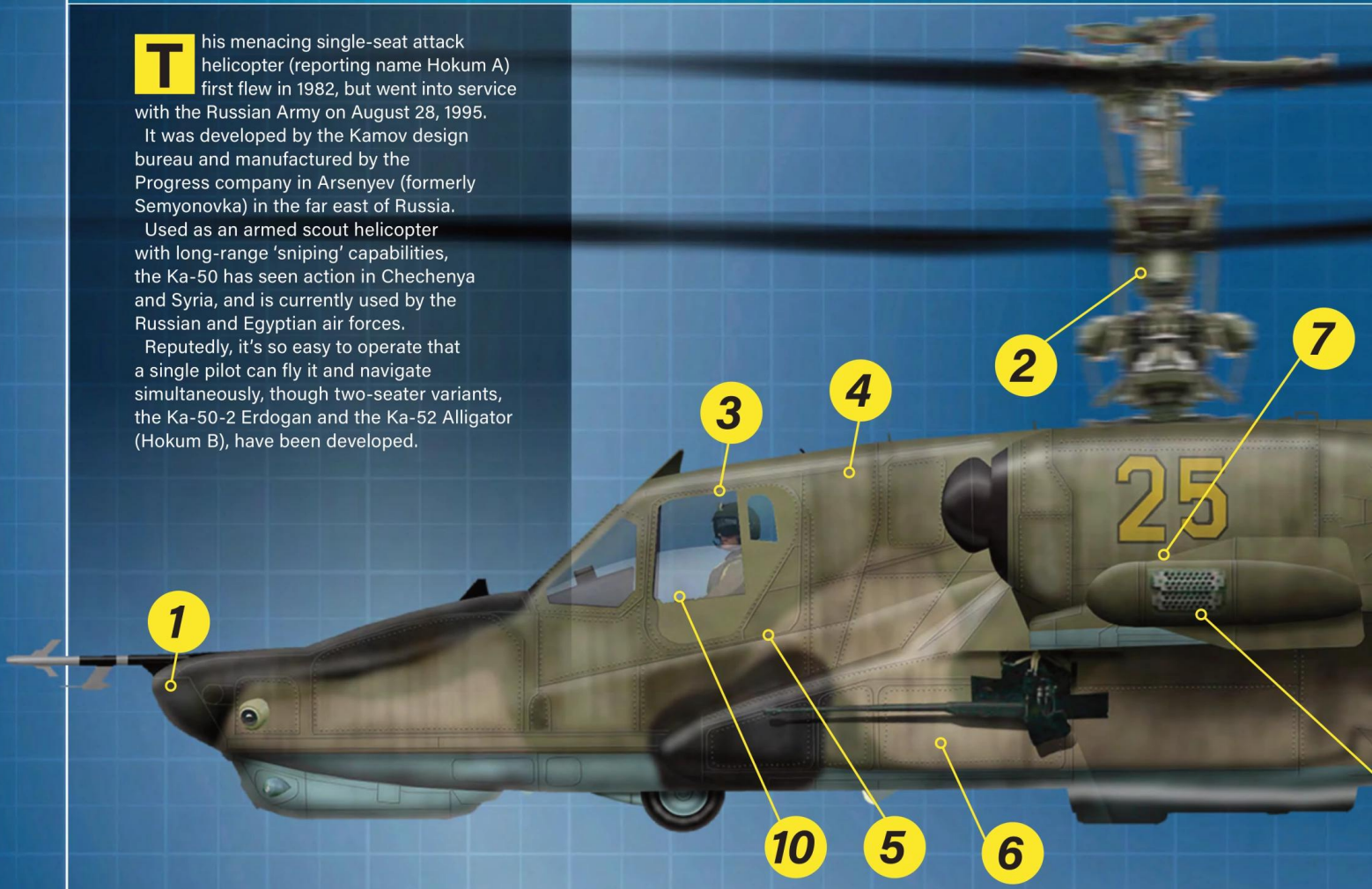
Kamov Ka-

This menacing single-seat attack helicopter (reporting name Hokum A) first flew in 1982, but went into service with the Russian Army on August 28, 1995.

It was developed by the Kamov design bureau and manufactured by the Progress company in Arsenyev (formerly Semyonovka) in the far east of Russia.

Used as an armed scout helicopter with long-range 'sniping' capabilities, the Ka-50 has seen action in Chechenya and Syria, and is currently used by the Russian and Egyptian air forces.

Reputedly, it's so easy to operate that a single pilot can fly it and navigate simultaneously, though two-seater variants, the Ka-50-2 Erdogan and the Ka-52 Alligator (Hokum B), have been developed.



1 The Ka-50 is designed to be small, light and manoeuvrable, increasing its survivability and lethality in combat scenarios

2 The Ka-50's three-blade, counter-rotating, coaxial rotor system removes the need for a tail rotor and makes it superbly manoeuvrable. The design results in inertia values that are 1.5 to 2.0 times lower than a typical helicopter with a tail rotor.
The Ka-50 can fly barrel-rolls and loops. It can also perform 'the funnel' circle strafing; this is where it flies 'sideways' in circles with its weapons remaining trained on the target.

3 Flight systems include autopilot, an inertial navigation system (INS) and a head-up display (HUD). The Ka-50 also features an electronic radio and sighting-piloting-navigating system. This allows flying during the day or night in IFR/VFR weather conditions.

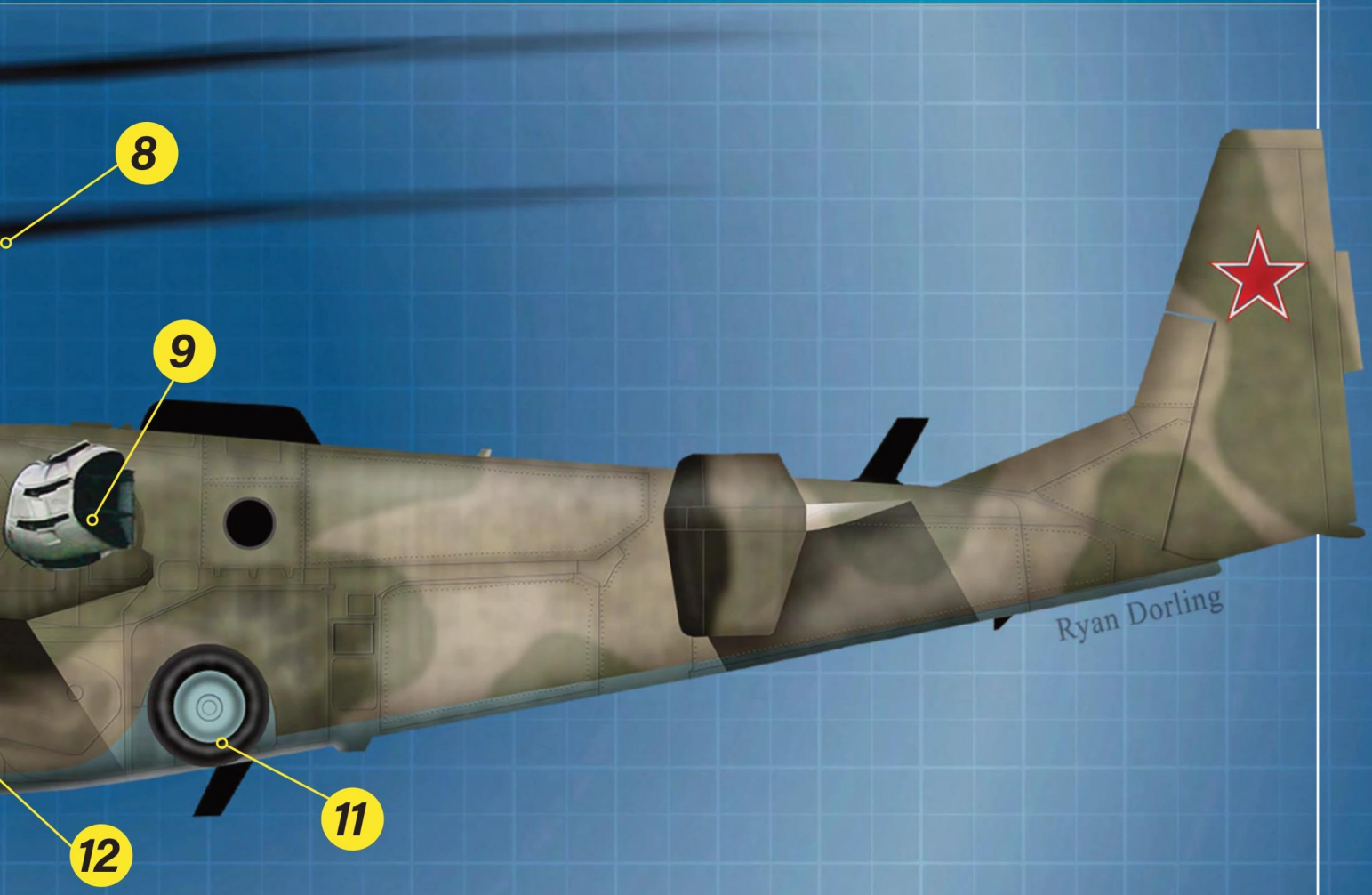
4 The Ka-50 can synchronise with other aircraft or ground positions to exchange precise target designations via digitally-encoded communications. It's also fitted with forward-looking infrared (FLIR) and terrain-following radar.

5 The Ka-50 features the world's first operational helicopter ejection system, which is rated for up to 5000m altitude and 350km/h speed. The K-37-800 rocket-assisted system first blows the rotor blades from their sleeves, then the canopy is ejected, before rockets fire and drag the seat out of the cockpit using cables.

-50

Twin rotors, two engines, armour, countermeasures, radar-warning receiver... and an ejector seat! Is Black Shark the most survivable helicopter ever?

Illustration **Ryan Dorling**
Words **John Sootheran**



6 A single-barrel, semi-rigid 30mm Shipunov 2A42 cannon is mounted on the side of the fuselage. It's three metres in length, weighs 115kg and comes with 460 rounds of ammunition. Its firing rate is between 200-800rds/min and is effective against light armour at 1,500m, air targets at 2,000m and 'soft' ground targets at 4,000m. The cannon has limited movement in elevation and azimuth, but this increases its accuracy. Though the entire helicopter has to turn to target its quarry, the Ka-50 is so manoeuvrable that it's reported to be able to find a target as quickly as the Apache's rotating turret and, when it does, it's more accurate.

7 The Ka-50 can carry a range of weapons or countermeasures weighing up to 2000kg on its four under-wing and two wingtip hardpoints. These can include:

- Eight 80mm S-8 rockets, plus 20 122mm S-13 rockets
- Two APU-6 missile racks, capable of carrying 12 9K121 Vikhr (Whirlwind) anti-tank missiles; Vympel R-73 air-to-air missiles or Kh-25 laser-guided air-to-ground missiles.
- Four 250kg (550lb) or two 500kg (1,100lb) bombs

8 The polymer rotor blades are designed to withstand hits from ground-based automatic weapons fire.

9 Twin engines allow for 'redundancy', thereby increasing the aircraft's survivability.

10 The cockpit is armoured and rated to withstand 12.7mm armour-piercing rounds and 23mm fragments/shrapnel.

11 The fuselage and landing gear are designed to be crash-absorbing.

12 Chaff and flare dispensers can be fitted to the wingtips. Each pod contains two dispensers containing 32 26mm countermeasures.

Specification

Crew: 1
Length: 16m (52ft 6in)
Height: 4.93m (16ft 2in)
Empty weight: 7,700kg (16,976 lb)
Gross weight: 9,800kg (21,605 lb)
Max take-off weight: 10,800kg (23,810 lb)
Engines: 2 x Klimov VK-2500 turboshaft engines
Main rotor diameter: 2 x 14.5m (47ft 7in)

Performance

Max speed: 315km/h (196mph, 170kn)
Cruise speed: 270km/h (170mph, 150kn)
Max power: 2 x 1,800kW (2,400shp)
Range: 545 km (339mi, 294nmi)
Combat range: 470km (290mi, 250nmi)
Service ceiling: 5,500m (18,000ft)
Max climb rate: 12m/s (2,400ft/min)

Israeli Air Force Superbase

Salvaged Spitfires and commandeered civilian aircraft made up the initial inventory of the Israeli Air Force (IAF). Avia S-199s (Czech-built copies of the Messerschmitt Bf 109) followed, after the formal establishment of the State of Israel in 1948. Originally known as the Air Service (Sherut Avir), the IAF immediately became a branch of the Israel Defense Forces (IDF), acquiring and procuring further Spitfires, as well as other types, including Bristol Beaufighters, Avro Ansons, de Havilland Mosquitos, North American P-51D Mustangs and three Boeing B-17 Flying Fortresses. Apart from the aforementioned Avias, which operated for only a very short time from a hastily-prepared grass strip at Herzliya, north of Tel Aviv, during its early years, the IAF relied on abandoned former RAF bases to conduct its operations. These were numerous close to the eastern shore of the Mediterranean, comprising Haifa, Ramat David, Megiddo and Ein Shemer in the North of Israel and a clutch of bases south and east of Tel Aviv: Lydda (now Ben Gurion International), Petah Tikva (Sirkin), Aqir (Tel Nof), Qastina (Hazor) and Ramleh.

Preparing to land at Hatzerim is F-16I Sufa serial number 862 from 107 'Knights of the Orange Tail' Squadron. Israel has long been a user of the F-16, originally operating F-16A/Bs and now flying F-16C/D/Is. The F-16I is the latest variant, an F-16D Block 50 specifically tailored to Israeli requirements, of which 102 were delivered. It is also flown by three other Israeli squadrons and the country's Flight Test Centre *David Weinrich*

In those early days, flight training relied on Boeing Stearman, Piper Cub and Harvard/Texan family aircraft, mainly based at Sirkin. However, the late 1950s and early 1960s saw a huge increase in the capability of the IAF with the arrival of a succession of first-generation jet fighters, initially Meteors from the UK and later France. To prepare pilots for this new challenge necessitated the incorporation of jet-powered trainer aircraft, for which role the Fouga Magister was selected. This resulted in the relocation of the flying school to Tel Nof and its longer runways, but this was only ever intended as a temporary solution.

In 1962, plans were drawn up for a new base to be constructed close to Kibbutz Hatzerim, west of Beer Sheva. Work was sufficiently complete in early 1966 for the flying school to move to Hatzerim and, by June 1967, more than 60 Fougas were stationed at the new 'Base 6', 47 of which participated in the Six Day War.

e Hatzerim

***David Weinrich** provides an overview of the varied types operating from Hatzerim Air Base*

***Above:** F-15I Ra'am serial number 223 from 69 'The Hammers' Squadron carrying a LANTIRN targeting pod flies over the former Olive Tree rest area as it makes its final approach to Hatzerim. Israel took delivery of 25 F-15Is between January 1998 and June 1999 – all are based at Hatzerim with 69 Squadron* David Weinrich
***Below:** McDonnell Douglas A-4N Ayit serial number 423 heads an impressive line-up of 102 Squadron A-4Ns and TA-4H/Js at Hatzerim after conducting their final flights in Israeli service on December 13, 2015. Towards the end of their service lives, they had operated purely in a training role at the base* David Weinrich

***Right:** One of the latest fighters in the Israeli inventory, the F-35I Adir variant of the F-35A Lightning II, makes a high-speed turn in full afterburner during one of Hatzerim's graduation displays. These traditionally take place on the last Thursday in June and also celebrate Air Force Day. Israel's F-35Is are based at Nevatim* David Weinrich
***Below:** An F-16I Sufa from 107 'Knights of the Orange Tail' Squadron taxies from its dispersal area at Hatzerim, as five others await launch* David Weinrich

Today, Hatzerim AB (ICAO code LLHS) comprises three runways: the southern, combat runway (10R 28L) at around 2,750m and the northern training runway (10L 28R) recently extended to approximately 2,500m. Just to the north-west is the flying school (Beit Sefer l'Tissa) area, sometimes referred to as Hatzerim North, with 1,830m of asphalt available, which is used by the academy's PFI (private finance initiative)-operated Grob G-120A Snunit and detached Beechcraft Tsofit Super King Airs. The rotary assets of the flying school also operate from this area with Bell OH-58 Saifan helicopters, soon to be replaced by an initial seven Leonardo AW119Kx, a result of the offset deal covering two G-550 AEW&C aircraft for the Italian Air Force (AMI). A combined search-and-rescue (SAR) and advanced helicopter flying-training detachment of S-70 Yanshuf (Black Hawks) is also located here.

After completing basic flying skills on the G-120As, cadets for the fixed-wing course progress to the Raytheon Beechcraft T-6A Texan II Efroni. Four aircraft were rushed into service following the withdrawal of the IAI Tzukit (a modified Fouga Magister) in 2009, quickly followed by 16 more. One aircraft, tail number 489, was severely damaged in a landing accident in July 2010 and eventually rebuilt as a simulator, with a replacement, tail number 498, arriving in late 2012.

For nearly 50 years, Hatzerim housed dozens of A-4 Ayit (Skyhawks) used exclusively in the twilight of their careers as advanced trainers. They finally bowed out in December 2015 to be replaced by a further manifestation of the Italian-Israeli defence accords, the Leonardo-Aermacchi M346 Lavi. Following Singapore and Italy, Israel is a major customer for this fourth- and fifth-generation lead-in fighter-trainer, now also bought by Poland (also an F-16/ future F-35 operator) and used by other countries training in Italy to prepare pilots for the F-35A. While the A-4s exhibited either squadron or flying school insignia,

Leonardo M-346 Lavi, serial number 104, prepares to land. All 30 Lavis in service in Israel are operated by 102 Squadron and based at Hatzerim. The first two were delivered to the base on July 9, 2014 David Weinrich

Above: *T-6A Efroni serial number 490 taxies out for take-off at Hatzerim. The aircraft is one of 20 operated by Israel, all of them with the Academy Flying School* David Weinrich

Below: *Israeli Air Force Academy Flying School Grob G120A-1 Snunit serial number 970/4X-DGK is one of 17 of the type based at Hatzerim to provide basic flight training* David Weinrich

Above: ***Bell AH-1F Tzefa (Cobra) serial number 651 (ex-US Army/77-22800) heads a line-up of 15 of the type. All of these rotorcraft are currently being held in storage at Hatzerim, but they are visible to anyone who is travelling along the Ofakim Road*** *David Weinrich*

all 30 Lavi aircraft feature the Flying Tiger emblem of 102 Squadron and operate from newly rebuilt sun-shelters on the flight line.

The last Thursday in June witnesses the traditional Air Force Day celebration at Hatzerim, misdar knafayim, when the cadets receive their wings from the heads of state and the defence forces, with a full-scale hasifat dragot (literally meaning 'exposing ranks') rehearsal the previous Tuesday, when the new pilots remove their cadet stripes to reveal Flying Officer insignia.

Recently, the length of the flying course has increased from three to four years, through the inclusion of academic work. Now, all new pilots graduate with a BA from the newly opened Air Force University in nearby Beer Sheva. There is also a misdar knafayim at the end of December, while in previous years there have been three concurrent courses, which is why the cadets of course number 180 graduated in June 2020.

Once in possession of those treasured wings, new pilots may sometimes stay at Hatzerim, joining one of the two fully operational combat units: 69 Squadron with Boeing F-15I Raam Strike-Eagles or 107 Squadron, which uses Lockheed Martin F-16I Sufa aircraft – heavily modified F-16D block 50s. The F-15Is replaced F-4E and RF-4E Phantoms from January 1998, and the F-16Is began arriving at Hatzerim in 2007 as the third Sufa squadron. These are scheduled to move south shortly to Ramon AB to join the other Sufa squadrons, while their area at Hatzerim will be redeveloped for the new F-15IA squadron when it re-forms later this decade.

Mention must also be made here of the Grumman E-2C Hawkeye Daya AEWs that were based at Hatzerim during their IAF career. These arrived in 1978, initially to provide targeting information for the F-15 and F-4 aircraft, but also performing other roles – including air-to-air refuelling – before being phased out in 1994.

Three of the four aircraft were then sold to Mexico in 2002, but that deal was plagued by technical issues and they were withdrawn and finally scrapped by 2013.

Of course, no review of Hatzerim would be complete without mention of the Israel Air Force museum located at the eastern edge of the base. In the late 1970s, the UK aviation restorer Robs Lamplough was able to acquire a number of Spitfires and Mustangs from schools and playgrounds around Israel in exchange for an airworthy T-6G Texan (G-BDZZ).

This must have rung some bells at the IAF, because, very soon afterwards, many of the remaining historic aircraft surviving at military camps and airfields were transported to Hatzerim and the IAF Museum was born.

At the time of this writer's first visit in 1988, some of the aircraft were still flyable, although today just a fully restored Stearman and the aforementioned T-6 fall into this

Above: ***Wearing a smart red and white training colour scheme, Agusta-Bell AB206A-1 Sayfan serial number 019 is one of 16 of the Italian-built variant of the JetRanger acquired by Israel, along with 23 OH-58B Sayfans, of which around four and 12, respectively, remain in service with the Academy Flying School*** *David Weinrich*
Right: ***The famous Israeli 'Black Spitfire', Mk IX serial number 57, shown while still active at Hatzerim. Although still kept with the Israeli Air Force Museum at the base, it has not been flown for some time*** *David Weinrich*

Sikorsky S-70A-55 Yanshuf-3, serial number 542, flies over Ofakim Road adjacent to the base. The helicopter is operated by the resident 123 'The Southern Bells' Squadron, which also flies the UH-60A variant of the Black Hawk. All ten UH-60As in Israeli service are flown by the squadron, while the 23 S-70A-55s are split between the unit and 124 'The Rolling Sword' Squadron at Palmachim. The latter also flies all of Israel's 15 S-70A-50s *David Weinrich*

category. The famous Ezer Weitzman (former commander of the IAF) Spitfire 'Black 57' has not been seen flying for a while. Plans to return other aircraft to flight status have foundered due to health, safety and insurance considerations. Nevertheless, more than 200 former IAF aircraft are either preserved or stored, and most can be viewed from public access areas on Sundays through Thursdays.

While the 102 Squadron Aermacchis may use either main runway, the Texans can usually be photographed circling for finals above the museum or from the adjacent Air Force Sculpture Garden, accessed by leaving the museum grounds and turning right past the P-51 Mustang gate-guard. Continuing further south along gravel tracks, takes you to a position between the two thresholds for a view of landings on both 28 right and left. The prevailing winds favour these runways around 90% of the time, and while the Olive Tree rest area is no more, its location on an adjacent hill is clearly marked and is ideal for fast-jet landing shots.

Ill-fated F-16I Sufa 107, the commander's aircraft from 107 'Knights of the Orange Tail' Squadron, on approach over the Olive Tree recreation area. The aircraft was lost on July 7, 2013, when it ditched in the Mediterranean after an engine malfunction. Both crew ejected safely and were recovered by a CH-53 Ya'sur helicopter *David Weinrich*

At Hatzerim North, a national park borders the approach road to the base from the town of Ofakim. With care, photos of circling Grob G-120s and active helicopters can be obtained.

Stating the number of aircraft in individual squadrons is often a sensitive subject in Israel, but Hatzerim Air Base is now home to more than 350 operational and displayed types and is likely to remain a 'superbase' for many years to come. AFM

Missile chasing in Fla

From early April to mid-June, Ukraine conducted four multiple test firings of its new R-360 anti-ship missile (ASM), part of the RK-360MTs 'Neptun' mobile coastal system. This ASM has been developed by the Kiev State Design Bureau 'Luch' in close co-operation with other Ukrainian aviation enterprises, including the Motor Sich plant at Zaporizhzhya, which provided the MS400 turbofan engine. According to official sources at 'Luch', the latest successful test firing on June 17 was the final one, and the system is now expected to enter operational service with the Ukrainian Armed Forces.

This sea-skimming ASM is an equivalent of the US Harpoon and Russian Kh-35 series of missiles and is intended for use against ships or large coastal targets. It has a combination of GPS-corrected inertial guidance in the initial phase of the flight and active radar homing in the terminal part. A maximum range of up to 280km is quoted by official sources, and an air-launched variant for use from modified Sukhoi Su-24s was announced last year (see 'The Odessa File', *AFM* October 2019, p76-81).

Starting from January 2018, more than ten separate series of test firings have been conducted at the Ukrainian Armed Forces' newly-established Alibey missile test range, located in the Alibey Lagoon on the Black Sea coast of the Tatarbunary district, Odessa province.

Aviation elements from State Border Guard Service of Ukraine and all three military services were actively involved in support of the tests, including the process of monitoring the closed-off portion of the Black Sea used by the test range and tracking the ASMs during their flight. The most prominent participant was undoubtedly a pair of modernised Sukhoi Su-27 (NATO reporting name: *Flanker*) fighters of the Ukrainian Air Force, provided by 831 Tactical Aviation Brigade (TAB) from Myrhorod air base.

Since 2019, when the ASM entered the advanced stage of testing, this pair has been ►

An R-360 ASM is fired from a mobile USPU-360 launch vehicle of the RK-360MTs 'Neptun' mobile coastal anti-ship missile system at the Alibey test range on April 5, 2019

Su-27UB1M, serial '71 Blue' , taxis by at Odessa International Airport after returning from a missile-chasing sortie on April 27

Above: The two chase planes taxi by before departing Odessa International Airport on April 27. They are Su-27P1M, serial '39 Blue', and Su-27UB1M, serial '71 Blue', of the 831 TAB at Myrhorod air base *Sergey Smolentsev*
Below: Ukraine's two Flanker chase planes – Su-27P1M, serial '59 Blue', and Su-27UB1M, serial '71 Blue', of the 831 Tactical Aviation Brigade – returning to Odessa International Airport on April 2, 2020 *Sergey Smolentsev*

ankers

Ukrainian Air Force Sukhoi Su-27s recently acted as chase planes for the nation's new R-360 anti-ship missile, as ***Vladimir Trendafilovski*** *reports*

The Su27s depart Odessa International Airport to support the missile launch on April 27 *Sergey Smolentsev*

used as chase planes. The choice of the highly-manoeuvrable Su-27 for the task does not come as a surprise since the ASM flies at high subsonic speeds. The pair operated from Shkil'nyy military apron at Odessa International Airport, where a Quick Reaction Alert (QRA) detachment of Su-27s of 831 TAB tasked with defending southern Ukraine is also based.

Generally, both aircraft took off simultaneously within 15 minutes of the scheduled launch in order to arrive over the test range on time. They followed and filmed the ASM from launch until it hit the target, including the last leg of the flight, when it descends to as low as 5m above the sea's surface. One of the Su-27s usually flew at a constant distance off its starboard side, while the other one actively manoeuvred around it, sometimes very closely.

This was also true during the final four series of test firings that were carried out in April, May and June. For these, the pair consisted of a single-seat Su-27P1M (s/n '59 Blue' for the launch on April 2; s/n '39 Blue' on April 27 and May 29; and s/n '56 Blue' on June 17), and a two-seat Su-27UB1M (s/n '67 Blue' on June 17 and s/n '71 Blue' on the other three occasions). During the earlier test firings in 2019, the pair consisted of two Su-27UB1Ms (s/n '67 Blue' and '71 Blue') on at least one occasion.

On May 29, the pair (pictured) took off at 0930hrs local time to conduct a training sortie alongside two USAF Rockwell B-1B Lancer bombers of the 28th Bomb Wing at Ellsworth Air Force Base in South Dakota, on a Bomber Task Force mission over Europe. The pair took over their escort duties from a pair of Su-27s from 9 TAB at Ozerne, and two MiG-29s from 114 TAB at Ivano-Frankivsk, which landed at Odessa and Kul'bakino, respectively. Immediately after returning from this sortie, the two aircraft were refuelled and took off again at 1100hrs local time in order to take up their role as 'missile-chase planes' over the Alibey test range. AFM

Above: ***This photograph was lifted from a video captured by Su-27UB1M, serial '71 Blue' , and shows the R-360 missile in flight at extremely close range*** *Ukraine Air Force via author* ***Below:*** ***Another image from a video taken by one of the Su-27 chase planes on April 7 this year, showing the R-360 missile fitted with an inert warhead successfully hitting its target, actually a disused barge*** *Ukraine Air Force via author*

Two Flankers taking part in an R-360 ASM test launch on June 17. The aircraft involved were Su-27P1M, serial '56 Blue', and Su-27UB1M, serial '67 Blue', from the 831 TAB. Both carried a pair of R-73 infrared-guided air-to-air missiles *Sergey Smolentsev*

This Ukrainian Air Force Su-27P1M, serial '39 Blue', assigned to the 831 TAB at Myrhorod air base, is taxiing in preparation to depart Odessa International Airport for the missile tests on April 27 *Sergey Smolentsev*

This image from a video shows Su-27UB1M, serial '71 Blue', of the 831 TAB tailing and filming the R-360 ASM missile in flight. This was captured during a test firing in late 2019 *Ukraine Air Force via author*

Above: ***Ukraine's single-seat Su-27P1M, serial '39 Blue', returning to Odessa International Airport after successfully supporting the R-360 missile test launch on April 27. The missile-armed single-seat Su-27s of the local QRA detachment are visible on the ground in the background of the photograph*** *Sergey Smolentsev*

Typhoons at Šiauliai

Despite the challenges posed by COVID-19, the Royal Air Force spent the summer in Lithuania supporting NATO's Baltic Air Policing mission, as ***Khalem Chapman*** *reports*

This summer's Baltic Air Policing (BAP) rotation at Šiauliai air base, Lithuania, began on May 1 and concluded on August 31. It was led by the Spanish Air Force, but was supported by the Royal Air Force (RAF) under Operation Azotize, the RAF's codename for its involvement in the ongoing NATO mission.

Four Eurofighter Typhoon FGR4s belonging to No 6 Squadron at RAF Lossiemouth in Moray, Scotland, arrived a Šiauliai on April 28. The multi-role fighters joined several Boeing F/A-18A Hornets from the Spanish Air Force at the Lithuanian base. French Air Force Dassault Mirage 2000-5Fs were also involved, operating from Ämari air base in Estonia for the duration of the rotation.

NATO launched its BAP mission on March 30, 2004. It exists to provide a quick reaction alert (QRA) capability for the Baltic states of Estonia, Latvia and Lithuania, which do not operate their own air-policing assets.

Over its 16-year existence, the air arms of NATO member states have rotated through the three Baltic nations to safeguard the airspace over the region. BAP has also become a platform for participating air forces to enhance their interoperability with fellow NATO allies and partner nations through integration and training.

During this summer's four-month rotation, British Typhoons conducted 10 scrambles and intercepted 15 Russian military aircraft flying through Lithuanian controlled airspace over the Baltic Sea. The RAF also took part in several exercises with NATO allies and partners.

Wg Cdr Stu Gwinnutt, commander of the 135th Expeditionary Air Wing (EAW), reflected on the recent rotation in a press release on September 1: "The deployment has been a huge success despite the ever-present risk of COVID-19, which we successfully navigated, through sensible contingency planning. Along with our Spanish and French partners, we've maintained the integrity of Baltic airspace and participated in numerous NATO maritime, land and air exercises."

Above: ***Wg Cdr Stu Gwinnutt, commander of the 135th EAW, speaking to service personnel and special guests at the handover ceremony of NATO Baltic Air Policing (BAP) duties to the Italian Air Force on September 1*** *MoD Crown Copyright/Cpl Nicholas Egan*

Below: ***An RAF Typhoon FGR4, serial ZK320 (c/n 312, line number BS081), departing Šiauliai air base in Lithuania on September 1, having completed the four-month deployment as part of Operation Azotize*** *MoD Crown Copyright/Cpl Nicholas Egan*

Deploying to Lithuania

This deployment marks the sixth time that RAF fighters have supported the NATO initiative under Operation Azotize.

The UK first participated in a BAP rotation in October 2004, when four Panavia Tornado F3s provided a QRA capability from Šiauliai. A decade passed before the RAF returned to the region for BAP duties in May 2014. However, this time the air arm deployed the Eurofighter, which replaced the Tornado F3 in the nation's domestic QRA role. Since then, the UK has been a regular participant in NATO's ongoing mission to secure the skies over the Baltic states.

Speaking about the recent deployment during a press conference in late June, Wg Cdr Gwinnutt said: "We have a tried and tested system in the RAF of supporting deployed operations, irrespective of which operation it is."

To undertake this summer's rotation,

RAF Typhoon FGR4s deployed in Lithuania flew alongside German Air Force EF-2000s on July 24, as part of an interoperability exchange between the two NATO nations
MoD Crown Copyright/SAC Iain Curlett

During a scramble on August 24, a pair of the RAF's Typhoon FGR4s intercepted and escorted an Il-20M 'Coot-A' from the Russian Navy over the Baltic Sea *MoD Crown Copyright/SAC Iain Curlett*

the RAF established the 135th EAW, which brought personnel from across the service together to deliver the QRA mission effectively.

"[The 135th EAW] provides everything we need to provide that foundation for QRA operations, which are fulfilled at the delivery end by the detachment from No 6 Squadron RAF and their Typhoons," said Gwinnutt. "We have a cross-section of the RAF and we've set up what is effectively a mini RAF station to provide those functions."

In total, the detachment comprises approximately 150 people. This includes pilots, aircraft engineers, medics and firefighters, along with personnel from the RAF's administration, communications and logistics divisions. "That's a pretty established size of an air wing for this kind of deployment," Gwinnutt stated.

Coronavirus challenges

Even before the deployment started, this rotation posed a unique challenge for the 135th EAW and those involved with this summer's BAP mission: the COVID-19 pandemic.

"The coronavirus is obviously affecting everyone around the globe, and it did affect us, but actually it was just a test for normal day-to-day RAF contingency planning," explained Gwinnutt. "Before we deployed, we were working from home, socially distancing and all the rest of it, just like everyone else. But we gave ourselves a bit more time, [using] technology to have those briefings and do all that preparation."

Prior to arriving in Šiauliai, RAF personnel were isolating and tested. As the UK was still a couple of weeks behind mainland Europe, the 135th EAW deployed to Lithuania during the height of the COVID-19 restrictions. This meant that personnel had to follow additional rules to stop any potential spread of the virus at Šiauliai. At the start of the deployment, people were socially distancing and wearing masks, in line with Lithuanian requirements. Despite this, the number of confirmed COVID-19 cases in the Baltic states was particularly low. By June, deployed personnel were starting to come out of the restrictive phase as things began to return to normal.

Wg Cdr Gwinnutt said that the pandemic did not affect the deployment from an operational standpoint: "We've been involved in some live QRA launches and we've conducted defence engagement training with different NATO partners that we set out to do before we came here. Once we got in, got established and started delivering on ops, its been a great distraction for us because it's just been business as usual."

Getting down to business

Throughout the four-month deployment, RAF Typhoons maintained a 24/7 QRA capability over the Baltic Sea region. During that time, the fighters conducted ten live scrambles and intercepted 15 Russian military aircraft.

On June 2, British Typhoons launched from Šiauliai for their first live scramble of the rotation. The fighters intercepted a Russian Aerospace Forces-operated Ilyushin Il-20M (NATO reporting name: *Coot-A*) intelligence, surveillance and reconnaissance (ISR) aircraft over the Baltic Sea.

Following the mission, a No 6 Squadron Typhoon pilot involved in the launch said: "The initial scramble was a real shot of adrenaline, but once airborne it was important to remain calm and professional and make the intercept as expeditious as possible to ensure we maintained both the safety and integrity of NATO airspace."

Another notable mission came when RAF Typhoons intercepted a formation of Russian military aircraft over the Baltic Sea on July 31, led by an Ilyushin Il-38 *May* from the Naval Aviation of the Russian Federation, being escorted by a pair of navy-operated Sukhoi Su-27Ps (NATO reporting name: *Flanker-B*). This scramble was the first time in recent years that the RAF had intercepted a *May*. The aircraft were operating alongside a Russian Oscar-class nuclear-powered submarine, which the fighters photographed on the surface of the ocean.

In the week leading up to the conclusion of the summer rotation, RAF Typhoons intercepted two Russian Navy Il-20/Il-22 *Coot* maritime patrol aircraft. According to Wg Cdr Gwinnutt, the two aircraft didn't comply with international air traffic regulations.

On August 28, two Typhoons completed their final mission in support of the BAP rotation. The fighters met with and escorted a US Air

Right: ***Eurofighter Typhoon FGR4, serial ZK333 (c/n 349, line number BS094), taxis to depart Šiauliai on September 1, when the fighters returned to the UK*** *MoD Crown Copyright/Cpl Nicholas Egan*

Above: ***An RAF Typhoon FGR4 flies in close proximity to a Naval Aviation of the Russian Federation-operated Su-27P Flanker-B, serial RF-33748 '92 Red' (c/n 36911031104), in late July*** *MoD Crown Copyright/SAC Iain Curlett*
Left: ***RAF Typhoon FGR4, serial ZK320, intercepts an Ilyushin Il-78M Midas, serial RF-94290 '31 Blue' (c/n 1003402040), of the Russian Federation Aerospace Forces on July 1*** *MoD Crown Copyright/SAC Iain Curlett*

Force Boeing B-52H Stratofortress long-range strategic bomber under Operation Allied Sky. The exercise saw six bombers fly over all 30 NATO member states in Europe and North America to demonstrate the alliance's solidarity and offer training opportunities to enhance co-operation.

Interoperability and training

Throughout the summer deployment, Typhoon FGR4s took part in a series of training exercises with NATO allies and partner nations, while maintaining their core QRA commitments.

Participation in these exercises has become more commonplace since the BAP's inception. It offers the unique opportunity for rotating air forces to train and integrate with alliance countries and their military arms in the region. BAP is also a platform for NATO members to enhance their interoperability with other allied forces.

In the June press conference, a Typhoon pilot from No 6 Squadron RAF, who can't be named for operational security reasons, highlighted the importance of collaboration between NATO forces: "We need to be interoperable with all the variants of the many different types of aircraft that are scattered across all of the NATO nations, and this detachment is no different to that.

"The [Typhoon] is a very agile, capable, modern aircraft. It's very easy for us to operate with jets from the other nations here on detachment. We have done a lot of missions as well, outside of the core [QRA] task."

During the deployment, RAF Typhoons took part in close air support training missions with NATO Joint Terminal Attack Controllers (JTACs) in Estonia and Lithuania. The British fighters were also employed in counter-helicopter training in Poland, where they intercepted Polish-operated W-3s that were simulating attacks on a friendly convoy.

"Counter-helicopter operations are one of the missions that we did specifically out here," explained the Typhoon pilot. "One of the roles is to potentially protect our troops on the ground and its actually a very difficult task to spot a helicopter. Luckily, with the Typhoon, we have a good radar with the Captor."

He went on to explain how the mission enhances understanding between NATO air arms: "We're speaking with Polish air traffic control, Polish JTACs and working with Polish helicopters. So, from our point of view, it's been very successful and really valuable training."

British Typhoons deployed to Šiauliai also participated in the BALTOPS exercise, the largest multinational military exercise that takes place in the Baltic Sea. Hosted annually by NATO, it provides an opportunity for air and naval assets to train together to enhance interoperability and maritime security capabilities.

"One of the [BALTOPS] missions that we flew, for example, was with the Finnish F/A-18s," explained the Typhoon pilot. "There's lots of integration training that we do across all the NATO nations that participate, as well as the multitude of ships that are there. It's a lot of air-to-air and ground training we do through the exercise, along with things we have to adapt to."

While deployed in Lithuania, RAF Typhoons conducted dissimilar air combat training (DACT) with their Spanish counterparts. "We do DACT, as its a really good skill set to learn if you're fighting against a different type of aircraft, which we don't get to do that often. We've done pretty good training from that, and I think the Spanish have benefited from it as well," the Typhoon pilot said.

A continued commitment

Over the past 16 years, BAP has become a well-established routine mission, where rotating nations work to NATO standard agreements. The initiative is set to continue for a while to come, and Wg Cdr Gwinnutt outlined the importance of the UK's involvement in ongoing alliance-led operations: "The UK's commitment to NATO is very important to us and its great for us to deploy. Not only for air-policing tasks, but also to have that opportunity to work with our allies while we're deployed on ops.

"Normally, we come together for an exercise for a week or two and we establish some relationships. We learn from each other, but then we go our separate ways. In this deployment, we can establish relationships, develop and share where appropriate, and learn from each other... It's really important for building bridges, building relationships and sharing experience."

At the end of August, the British, Spanish and French rotated off BAP duties, handing over to the Italian and German air forces, both of which have deployed their Eurofighters to the region.

Italy began sharing its air policing tasks between the Eurofighter and the air arm's new Lockheed Martin F-35A Lightning II, fifth-generation multi-role stealth fighter. When asked if the RAF was considering the same move with its F-35Bs, Gwinnett said: "The current plan is for it to be a role specific to Typhoon. I'm not sure how its going to go in the future, but as far as we're planning at the moment, it's a Typhoon-specific mission."

At the present time, there is no confirmed date for the RAF to return to the Baltic to execute further BAP duties. However, the air arm will be redeploying its Typhoons to the region again in the future to continue safeguarding the skies over the Baltic, and to further enhance the interoperability with allied air arms in the area. AFM

A Russian Navy Oscar-class submarine is photographed on the surface of the Baltic Sea by a Typhoon FGR4 in late July *MoD Crown Copyright/Cpl Nicholas Egan*

Report released into Global Hawk crash off Spain

***Above:** The fuselage of USAF RQ-4B Global Hawk 09-2041 was recovered from the sea off Spain and returned to Grand Forks AFB after its crash on June 26, 2018* USAF

Air Combat Command released an aircraft accident investigation report on July 7 into the loss of a US Air Force RQ-4B Global Hawk off the coast of Spain in 2018 (see *Attrition*, November 2018, p89). The report identified the aircraft involved as serial number 09-2041.

On June 26, 2018, at approximately 0919 hrs local time, an RQ-4B Global Hawk, tail number 09-2041, made impact with the ocean off the coast of Rota, Spain, about 13 hours and 24 minutes after take-off from Grand Forks Air Force Base (GFAFB) in North Dakota. It had embarked on a scheduled extended range transfer/ferry flight to an unspecified downrange operational location. The remotely-piloted aircraft (MRPA) was assigned to the 9th Reconnaissance Wing at Beale Air Force Base, California, but was located at one of its geographically separated units, the 69th Reconnaissance Group, 348th Reconnaissance Squadron (RS), at GFAFB.

The crew on board were assigned to the 348th RS and they were all active-duty members of the unit. The accident did not result in any injuries or damage to private property. The MRPA, along with its payload sensor system, together valued at $98.83 million, were destroyed.

Prior to the crash, the MRPA's airframe had 208 sorties/landings and 3,772.6 flying hours. On June 25, 2018, between 0730 and 1840 hrs, maintenance and aircrew personnel conducted pre-flight inspections at GFAFB before the MRPA was towed to the launch location and took off at 1956 hrs. Taxi, take-off, climb out and cruise to 51,000ft were uneventful. After approximately 11 hours and 49 minutes, at 0745 hrs, the MRPA received initial engine fault codes indicating low oil quantity (oil level less than 1.5 gallons) and one minute 40 seconds later this had reduced to less than one gallon. Two minutes and seven seconds later, at 0749:10 hrs, oil pressure had dropped to less than 53 pounds per square inch (psi), dropping to less than 48psi 24 seconds later.

At this time, the mishap pilot (MP) declared an inflight emergency and descended to 45,000ft. After the engine core experienced severe vibrations, at 0811 hrs (26 minutes after the first indication), the MRPA's engine experienced an uncommanded inflight shutdown, based on system faults ranging from low oil quantity to oil pressure to engine vibration, consistent with an oil leak rapidly emptying the oil tank followed by oil starvation and eventual mechanical failure.

At 0812 hrs, the MP made the decision to divert the MRPA to an emergency route. In accordance with training and the approved mission plan, as the aircraft's batteries began to fail, causing voltage to fall below tolerance and preventing continued guidance control, the MP made the decision at 0908 hrs to crash/ditch the MRPA in the ocean. At approximately 5,700ft, the pilot issued a heading override to ditch the aircraft. The MRPA continued to glide for 11 minutes and, at 0919:10 hrs, it crashed into the ocean, approximately 23 nautical miles west-southwest of Naval Station Rota in Spain, avoiding the loss of human life and infrastructure damage.

Wreckage was spread over approximately 11nm. Both the wings and several other flight surfaces separated at the time of impact and remained on the surface. The main body of the aircraft, including the fuselage and engine, sank to the bottom of the ocean. On June 26, 2018, initial recovery took place of components that had remained floating on the surface. On August 8, 2018, the fuselage, engine and electronic components were recovered from the seabed. All salvaged parts were then shipped back to GFAFB to be examined by the accident investigation team.

The president of the accident investigation board found, by a preponderance of evidence, that the cause of the mishap was a leak from a cracked oil line, which caused an engine un-commanded in-flight shutdown. More specifically, a high cycle fatigue failure of the accessory gearbox pressured oil line was the root cause of the incident.

Furthermore, it was established by the investigators, by a preponderance of evidence, that the unit's approved mission plan for the mishap sortie did not provide the MP with sufficient emergency divert airfields for unpowered aircraft recovery, substantially contributing to the mishap. The MRPA had managed to glide for nearly an hour towards the emergency divert airfield at Rota, but ultimately the MP calculated that the MRPA would not safely make it to the base.

Accident Reports

D: Feb 8, 2013
N: Ecuador Air Force/ Combat Wing 21/ Combat Squadron 2112
T: Cheetah C
S: 1368

In an incident that went unreported by *AFM* at the time, this aircraft was damaged during a landing accident at Base Aérea Taura. By October 2014 it was in storage at Manta and it now appears it was not repaired. The aircraft was recently brought up to static display standard for preservation at Taura, where it was formally unveiled on August 29, 2020, dramatically mounted on a pole in a vertical attitude as part of s monument, during celebrations to mark the 65th anniversary of Combat Wing 21.

Ecuador Air Force Cheetah C being unveiled on August 29, 2020, in a dramatic pose as part of a monument at Taura Air Base. The aircraft was damaged beyond repair in a landing accident at the base on February 8, 2013 *FAE*

D: Jan 9, 2020
N: Israeli Air Force
T: 8 x F-16C/D Baraks including F-16Cs 534, 542 and 551

Adding to the original report in *AFM* on the flood damage to these aircraft at Hatzor (see *Attrition*, March, p108), an IAF report published on June 12, 2020, stated that all damaged aircraft had been returned to operational service. Those less seriously affected were repaired in situ at Hatzor by the Aerial Maintenance Unit (AMU) from Tel Nof, while several that were extensively damaged were moved to the AMU headquarters at Tel Nof for rebuild. Images with the IAF story confirmed the three serials listed above were aircraft that had been rebuilt at Tel Nof and all wore 101 Squadron, The First Fighter Squadron, unit markings.

D: Apr 5
N: Libyan National Army
T: An-26
S: UP-AN601

Updating the previous report on the loss of this aircraft (see *Attrition*, June, p89), two images released on May 7 confirm the type as an An-26, not an An-32, with the registration given above. The location was, more precisely, at Buaisha, near Tarhuna. In one photo the aircraft is on fire shortly after being hit on a road being used as a makeshift runway. The other shows it was completely burnt out after the attack, which is still believed to have been carried out by a Bayraktar TB2 UAV, possibly after the aircraft had landed.

D: Apr 15
N: French Army Air Corps/5e RHC/EHM 3 'Grizzly'
T: AS532UL Cougar
S: 2336 'CGV'

Update to the original incident report (see *Attrition*, June, p90), the serial number of the aircraft is as given above.

D: Jun 28
N: Brazilian Air Force/ 1-14º GAv/Pampa Squadron
T: F-5FM Tiger II
S: FAB 4807

During trials by the IPEV – Research and Flight Testing Institute, on loan from 1º/14º GAv, both main tyres and the wheel hubs were destroyed as the aircraft landed at São Paulo-Guarulhos Airport. No injuries were reported.

D: Jul 2
N: US Air Force
T: B-1B Lancer

An in-flight electrical malfunction 30 minutes after take-off forced the crew to make an emergency landing. The two outer port main undercarriage tyres had blow-outs and there was an undercarriage brake fire. None of the four crew were injured. The location is unconfirmed, but believed to be Dyess Air Force Base, Texas.

D: Jul 24
N: German Air Force/HSG64
T: CH-53G

This helicopter made a precautionary landing in a meadow near Stuttgart while on a training flight from Laupheim after a warning light illuminated in the cockpit. There were no injuries to the crew and the CH-53 appeared to be undamaged but was being checked over as a precaution.

D: Jul 28
N: Royal Air Force/18 Squadron
T: Chinook HC6A
S: ZA683

Updating the previous report on the wire-strike incident involving this helicopter (see *Attrition*, September, p91), it has since been recovered. Repairs were completed on site by a team of engineers from RAF Odiham, Hampshire, who replaced the smashed cockpit glazing and carried out comprehensive checks. Subsequent to this, a crew from 18 Squadron travelled to the site and it was safely flown back to its base at RAF Odiham on August 7.

Above: ***Israeli Air Force/101 Squadron F-16C Barak 542 taking to the air again from Tel Nof Air Base, where it had been rebuilt after sustaining extensive damage during flooding at Hatzor Air Base on January 9*** *Israeli AF/Amit Agronov*

Abbreviations: **D:** Date **N/U:** Nationality/Units **T:** Type **S:** Serials

Attrition Report

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D: Jul 30
N: Brazilian Federal District Military Fire-fighting Corps
T: Helibras AS350B2 Ecureuil
S: PR-MJX

On approach to land in a street adjoining the Unidade Básica de Saúde 1 (healthcare centre) in Vicente Pires, Federal District, Brazil, at around 1035hrs local time, this Military Fire Brigade helicopter, callsign 'Resgate 02', kicked up a large dust cloud, creating brownout conditions which caused a visually degraded enviroment for the pilot. The Ecureuil then struck the adjacent building with its main rotors and crashed. All five on board sustained injuries and were taken to hospital for treatment. The wrecked helicopter was removed the following day and delivered to the 25th Military Firefighter Group's base in Águas Claras for investigation.

D: Aug 3
N: US Navy
T: EA-18G Growler

During an initiated built-in test at Nellis Air Force Base, Nevada, the port engine failed, resulting in damage from metal debris and cracks in the exhaust section. The incident was categorised by the US Naval Safety Center as a Class A mishap, indicating more than $2.5 million-worth of damage.

D: Aug 4
N: Mexican Navy/Naval Air Squadron 411
T: Maule MX7-180A Sportplane

The starboard main undercarriage and tailwheel of this aircraft collapsed on landing at 1220hrs local time at Los Mochis-Valle de el Fuerte International Airport and the aircraft came to rest with its starboard wingtip resting on the runway. The crew were uninjured.

D: Aug 7
N: Russian Air Force
T: Mi-8AMTSh

This helicopter collided with power lines, resulting in considerable damage to the nose section including a large hole. Most of the cockpit glazing was also smashed and the frame severely distorted. The helicopter landed safely, but it was not reported where the incident occurred or whether any of the crew members sustained injures.

D: Aug 10
N: Indonesian Air Force/SkU 15
T: T-50i Golden Eagle
S: TT-5006

This aircraft skidded off the runway during take-off from its base at Madiun-Iswahyudi Air Base, East Java, at around 1300hrs local time. The rear crew member ejected safely, but the front occupant remained with the aircraft, which was reported to have sustained significant damage. Both crew were taken to hospital but the pilot later died from his injuries.

D: Aug 10
N: Romanian Air Force/ Carpathian Pumas Det/MINUSMA
T: IAR-330L-RM Puma

While parked at Douwntza Air Base in the Mopti region of central Mali, this helicopter was damaged at around 1700hrs Romanian time when it was overturned during a sudden violent storm. There were no injuries during the incident. The Puma was one of two undertaking a reconnaissance mission and had landed at Douentza to refuel before returning to its base at Gao. The helicopter is one of four IAR-330L-RMs deployed since October 2019 to support MINUSMA, the UN Integrated Multidimensional Stabilization Mission in the Republic of Mali.

D: Aug 10
N: US Air Force/ 1st Helicopter Squadron
T: UH-1N Huey

While on a routine training mission at around 1220hrs local time, flying at 1,000ft near Middleburg, Virginia, about 16km northwest of Manassas Regional Airport, the helicopter was fired on and a bullet penetrated the cabin. One crew member sustained a minor injury. A safe emergency diversion was made to Manassas Regional Airport and the injured crew member was treated at a local hospital and later released. There was also some damage to the airframe. The FBI is investigating the incident.

D: Aug 10
N: US Air Force/20th Special Operations Squadron
T: CV-22B Osprey

This tiltrotor made a precautionary landing in a field about 37km south of Fort Sumner, New Mexico, after a minor equipment problem during a routine training flight from Cannon Air Force Base, New Mexico. The crew were uninjured and although the Osprey landed safely, it could not immediately be flown out again and as of August 30 it was still in the field undergoing on-site repairs by a team from Cannon.

D: Aug 11
N: Royal Thai Navy/ 102 Squadron
T: F27 Friendship 200ME Maritime Enforcer
S: 1202

After a flight from its base at U-Tapao to Narathiwat Airport, crew members were unable to lower the nose undercarriage. At 1159hrs local time an emergency landing was performed at Narathiwat with the nosewheel retracted, the crew holding the nose off the ground for as long as possible to minimise damage. The aircraft landed safely and no injuries were reported to the 17 personnel on board. Damage appeared to be minimal.

D: Aug 11
N: Russian Air Force/764th IAP
T: MiG-31 *Foxhound*

Following the loss of one of the main undercarriage wheels, the aircraft returned to its base at Bolshoye Savino-Perm for an emergency landing. On touching down, a fire broke out in the main undercarriage and the aircraft ran down the runway trailing a streak of flames. After coming to a halt, the fire service quickly extinguished the conflagration and damage appeared to be confined to the undercarriage area. There were no injuries reported to the two crew.

***Above:** Royal Air Force/18 Squadron Chinook HC6A ZA683 showing repairs the extensive damage to the cockpit glazing and nose section sustained during a wire strike in Wales on July 28. It is seen here on August 7 after a team from its base at RAF Odiham, Hampshire, had replaced the glazing and made temporary repairs in situ to enable it to fly home later that same day.*
MOD Crown Copyright/RAF Odiham

Abbreviations: **D:** Date **N/U:** Nationality/Units **T:** Type **S:** Serials

A Royal Netherlands Air Force AH-64D Apache in a field in the Waspik area after a precautionary landing on August 21. Following an on-site repair, it was flown back to Gilze-Rijen Air Base later the same day DHC Luchtmacht

D: Aug 12
N: US Air Force
T: MQ-9A Reaper?

This UAV was lost in a crash near Agadez in northern Niger following a technical failure. The wreckage was recovered later the same day. The type is unconfirmed.

D: Aug 13
N: Russian Air Force
T: L-39C Albatros

This jet trainer crashed in a remote area during a training flight in the Krasnodar region. Both crew members ejected safely and were unhurt.

D: Aug 14
N: US Navy/HSC-23 'Wildcards'
T: MQ-8B Fire Scout

This UAV crashed after it backed into a building, hitting it with its main rotors, at 1221hrs Pacific time at Naval Base Ventura County (NBVC), Point Mugu, California. No personnel were injured. Damage to the building was superficial, but the incident was reported as a Class A mishap by the US Naval Safety Center, indicating more than $2.5 million-worth of damage to the MQ-8B. There was no fire or explosion, but NBVC's Federal Fire Department responded and applied firefighting foam to the scene as a precaution. The MQ-8B was assigned to Helicopter Sea Combat Squadron 23 (HSC-23) at Naval Air Station North Island, California, but was at NAS Point Mugu as part of a training detachment.

D: Aug 18
N: US Air Force or CIA?
T: 2 x MQ-9A Reaper

Both of these UAVs crashed after what Pentagon officials claim was a mid-air collision over Idlib province, Syria. Images posted online show at least one of them spiralling vertically downwards in flames before impacting the ground. Although officials declined to identify the type, images of the burning wreckage on the ground clearly showed that they were Reapers. Turkish-backed militia groups claimed to have shot them down over al-Sheikh Bahr with Roketsan FIM-92 Stinger MAPADS, but this could not be confirmed. However, as the type is equipped with a Traffic Alert and Collision Avoidance System, it seems unlikely they would have collided under normal circumstances, unless there was a malfunction on one of them or control was lost as a result of being hit by a missile. The precise operator of the MQ-9As remains unconfirmed, as both the CIA and USAF have been operating the type over Syria.

D: Aug 21
N: Royal Netherlands Air Force/301 Squadron
T: AH-64D Apache

During the afternoon, this helicopter made a safe precautionary landing in the Waspik area. The crew were uninjured. A technical team was dispatched from its base at Gilze-Rijen and they were able to repair the helicopter on site, enabling it to fly back to Gilze-Rijen before the end of the same day.

D: Aug 23
N: Turkish Air Force
T: Bayraktar TB-2

This UAV was destroyed when it was shot down over Syria by the Syrian Arab Army. The location was not reported.

D: Aug 27
N: Ukrainian Air Force/39th Tactical Aviation Brigade
T: Su-27S
S: '24 Blue'

While practising emergency landings on Ukrainian international highway M06 between Kiev and Chop, the pilot of this aircraft appears to have miscalculated the touchdown and approached too low, resulting in a collision with a road sign. The sign was torn off and became embedded on the lip of the port engine intake, where it still remained when the aircraft returned to land at its base. No injuries were reported and damage to the aircraft was minimal.

D: Aug 27
N: US Army/160th Special Operations Aviation Regiment
T: MH-60M Black Hawk

This helicopter crashed on San Clemente Island, California, during a routine training mission late at night. Two of the five on board were killed and the other three injured. No further details on the accident have been released.

D: Aug 31
N: US Navy/VAW-120
T: E-2C Hawkeye

After taking off from Chambers Field, Naval Station Norfolk, Virginia, for a routine training mission, the aircraft was destroyed when it crashed in a soybean field and caught fire at the intersection of Berry Road and Mason Road (Virginia State Routes 680 and 681, respectively), near the town of Nelsonia, in Accomack County, close to the NASA flight facility at Wallops Island on Virginia's Eastern Shore, just south of the Maryland border, at 1550hrs local time. The pilot, co-pilot and the two other crew members on board bailed out safely, exiting through the main cabin door and parachuting to safety, following which they were undergoing medical examination. NASA Wallops Island is regularly used by the USN for Field Carrier Landing Practice.

D: Sep 1
N: Afghan Air Force
T: Mi-17

After a flight from the 217th Pamir Corps base at Kunduz, the helicopter had a technical malfunction and crashed and rolled over while trying to land in the Rustaq district of Takhar province. There were no serious injuries to the 12 on board.

D: Sep 2
N: US Air Force/49th Wing
T: MQ-9A Reaper

While taking off at Holloman Air Force Base, New Mexico, at approximately 0830hrs local time, the UAV departed from the runway and sustained unspecified damage. No other aircraft were involved.

D: Sep 3
N: US Marine Corps
T: CH-53E

During a flight from Marine Corps Air Station New River, North Carolina, the helicopter made a precautionary landing at about 1400hrs local time near Pilchers Branch Road, Sneads Ferry. The four crew exited the CH-53E safely, but it caught fire and was destroyed.

Additional material: Igor Bozinovski, Donny Chan, Scramble/Dutch Aviation Society and Asagiri Yohko.

***Above:** A tow truck prepares to remove a US Air Force/458th Airlift Squadron C-21A Learjet from the Squadron's flooded Hangar 3 at Scott Air Force Base, Illinois, on August 12. A storm cell deposited 14cm of rain on the base in two hours, causing flash flooding. At one point water was coming up to the undersides of the aircraft* USAF Senior Airman Miranda Simpson

Certifie

By the end of June 2020, two L-39NGs had flown 233 flights and completed a major part of the flight characteristics testing. The prototype has been involved in 150 of those sorties

d Czech

*The new multi-role jet trainer, the Aero L-39NG, heads towards certification this month. **Alan Warnes** meets the makers behind the Czech aircraft that promises to push the envelope*

This month, the Aero L-39NG is finally expected to receive its airworthiness certificate. The Czech Republic, Hungary and Slovakia could all be in the market to buy this new turbofan-powered military jet trainer, if recent comments are to be believed. On July 7, Czech Defence Minister Lubomir Metnar said he and his Hungarian counterpart had aspirations of creating a new training concept for the Visegrád Four (V4) Central Europe alliance. While it's likely Slovakia could join them, it's more difficult to see Poland, the fourth V4 member, doing so. Still, it's good news for the Aero L-39NG, which has endured a difficult time since its launch at Farnborough International Airshow back in July 2014.

Aircraft repositioning

The new advanced jet trainer is a modern version of the Aero L-39 Albatros operated by many air forces across the world. Aero established itself as a legend in the aviation industry after building 2,865 L-39 and 3,665 L-29 Delphin jet trainers during the Cold War. Transitioning from the Soviet Union's communist ideology to the free market has, of course, been difficult for the company.

By the time L-39 production had finished in 1996, the company had already dabbled in a westernised L-59 with a more powerful Slovak DV-2 engine – but just 60 of the latter were sold to two international customers, Egypt and Tunisia.

The L-159 Advanced Light Combat Aircraft (ALCA) fared slightly better, when the Czech Air Force bought 72, although this was cut back to just 24. The remainder were put into storage during the mid-2000s, before being sold to the Iraq Air Force, Draken International (for 'red air' operations) or being used as spares.

Aero is expecting the L-39NG to be certified this month, much later than was originally envisaged at its Farnborough International Airshow launch.

Former Leonardo Eurofighter test pilot, Marco Venanzetti, took over as L-39NG vice-president in August 2016, tasked with shaping the new trainer's capabilities. He told *AirForces Monthly*: "When I came here there was a project, but the design was not frozen, [so] we had to reposition the aircraft in the market. Now it is ready and we believe we have the best training solution out there – with fantastic avionics systems and an on-board virtual simulation."

New configuration

Although the initial idea was to modify the original L-39, many improvements and changes resulted in a new aircraft. While the L-39 was built around Eastern European systems, the L-39NG is working with Western technologies. The original Ukrainian AI-25TL powerplant has been replaced by the US-made Williams FJ44-4M, boasting a thrust level of 1,750kg ▸

Left: ***The prototype L-39NG was rolled out at Aero Vodochody on October 12, 2018*** *Alan Warnes*
Below: ***Test pilots David Jahoda and Vladimír Továrek were behind the controls of the prototype during its first flight*** *Aero*

Above: Pre-series L-39NG, 7004, taxies out for its first flight on December 9, 2019. By June 2020, the jet had flown 83 missions. *Alan Warnes* ***Below: Aero's L-39C, 2626, was upgraded to a L-39CW derivative, with a new Williams FJ-44 engine and Genesys avionics. Certification was granted in late 2017 and, as the L-39NG technology demonstrator, has helped the L-39NG certification process*** *Alan Warnes*

and the ability to reach speeds of up to 775km/h. Being developed for commercial aircraft means the engine is ITAR compliance-free.

The US Genesys Aerosystems avionics and two 20.32x15.24cm multi-function displays with a Czech-built Speel Head-up Display (HUD) ensures the cockpit looks every inch a modern jet trainer. An embedded Israel Aerospace Industries virtual training system (VTS) allows cost-effective training.

New 'wet wings', carrying 1,300kg of fuel inside bladders within the wings, provide a range of up to 2,590km. Without tip-tanks, the L-39's weight has been reduced, boosting the aircraft's manoeuvrability. Venanzetti, who left the company on April 30, told *AFM* before his departure that no other turboprop or jet trainer can match the L-39NG.

"A turboprop trainer cannot operate above 25,000ft (7.6km), it cannot fly over 280 knots (519kp/h) and cannot sustain the major Gs experienced in real combat ops," he said. "The L-39NG can do all these but with the same acquisition costs as the turboprop and sometimes the operational costs are less."

The most striking difference between an old generation L-39C and the L-39NG is the all-in-one cockpit, with its elevated rear ejection seat giving the pilot (usually an instructor) a much better view. Two Martin-Baker Mk16CZ ejection seats, fitted during mid-2018, mark the first time a Martin-Baker seat has appeared in a L-39.

"This aircraft has been conceived not only

The L-39NG is a modern version of the very successful L-39 – but it will have to go some way to emulate the sales of its predecessor *Alan Warnes*

L-39NG designer Jaromir Lang is heading up the flight test programme Alan Warnes

Both L-39NG test aircraft flying in formation, after 7004 made its first flight on December 9, 2019 Alan Warnes

for easy maintenance, affordable cost and affordable flight per hour, but also as part of a comprehensive system that includes synthetic devices/simulators," said Venanzetti. "We have a state-of-the-art on-board training system that simulates almost anything for operational and normal flying and can be adaptive to any frontline fighter. You can download a lot of the training in a role that can be more cost effective, without flying something that costs a lot to operate."

Light attack version

Being developed alongside the advanced jet trainer is a light attack version. In light combat, the aircraft will be capable of carrying 1,650kg of weapons. The Senegal Air Force signed a power-by-the-hour deal for four aircraft in 2018, but the financial aspects have yet to be concluded. With no structural modifications required to convert the trainer version to light attack, it could be an attractive option for those air forces with a limited budget.

The basic configuration of the light attack L-39NG will include two 350-litre wet-tanks, Mk81 (113kg) and Mk82 (227kg) laser-guided freefall bombs, CRV-7 unguided/guided rocket launchers, and a single/twin-barrel 12.7mm gun-pod that is available on centre-line as well as on two under-wing pylons. The fully-digitised Elbit Systems Targo II helmet-mounted system will also be integrated for Senegal's aircraft.

Aero's initial strategy was to offer all current operators of the L-39C an upgrade to their existing platforms with new engines and avionics, before they bought the L-39NG. Current fleets could be upgraded to a 'phase one' standard known as the L-39CW (W denotes Williams International). Once the airframe's flying time expires, the avionics and engines could then be transferred into an L-39NG airframe.

Aero developed its company Albatros, 2626, into a L-39CW technology demonstrator. Essentially, it was used to prove all the systems going into the L-39NG and to speed up certification. Initially flying for 200 hours with the civilian FJ44-4A derivative, Aero engineers then worked with Williams on the military version, known as the FJ44-4M. By August 2019, eight months into flight testing, the L-39NG aircraft designer, Jaromir Lang, was happy with the progress.

"The -4M is a bit more robust than the civilian -4A, to cope with high G-loads during high manoeuvres," he told *AFM*. "We have put it through the full flying envelope – spinning, stalling, full aerobatics and there have been no issues."

With no requirement for wing-tanks because of the L-39NG's wet-wings, Aero designed a new set of tip-tanks and fitted them on to the L-39CW. The main change to the L-39CW internally was the Genesys 'glass' cockpit allowing the integration of the VTS system. Certified in late-2017, the testbed helped to speed up the certification process before the two new L-39NGs joined the flight test programme.

Today, 2626 is used as a pattern aircraft for MRO (maintenance, repair and overhaul) contracts and upgrades, like the six L-39Cs for Ethiopia. They will have NG avionics installed, with eastern symbology. "It is interesting to see how Genesys tweaks the software to show the speed in kilometres and altitude in metres," said Lang. "Ethiopia is using the original AI25TL engine; to transfer the engine data to the avionics we have developed a special converter so the gauges illustrate the measurements in metric."

In addition to Senegal's four light attack aircraft, Aero signed two letters of intent (LOIs) at Farnborough International Airshow in 2018 for the sale of more L-39NG/L-39CWs. Lisbon-based Skytech penned a financial commitment for 10 L-39NGs, with an option for six more. Phoenix-based RSW Aviation committed to 12 L-39NGs, as well as the upgrade of its five L-39Cs and single L-39ZA to L-39CW/L-39ZAW version. However, neither contract has materialised, while the deal to sell four L-39NGs to Czech government-owned LOM Praha's Flight Training Centre (CLV) to train Czech Air Force (CzAF) pilots has yet to be signed. CLV must replace its seven ageing L-39Cs used in the advanced jet training role by 2022, and time is running out.

Flight testing

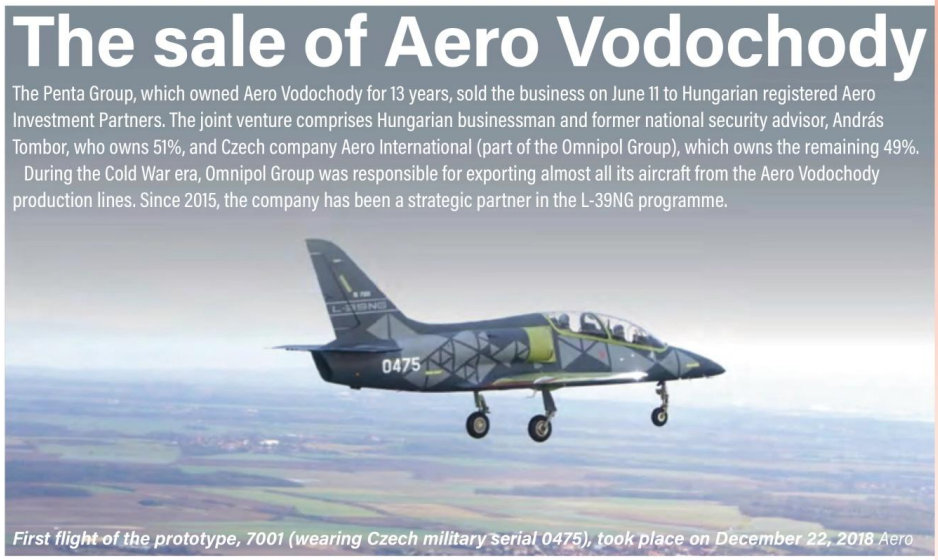
Back in October 2018, the prototype L-39NG, 7001, was rolled out to great fanfare in front of Czech Prime Minister Andrej Babiš, who said at the time: "I will personally support

Aero Vodochody CEO Dieter John is steering the L-39NG towards the EMACC certification this month Alan Warnes

The sale of Aero Vodochody

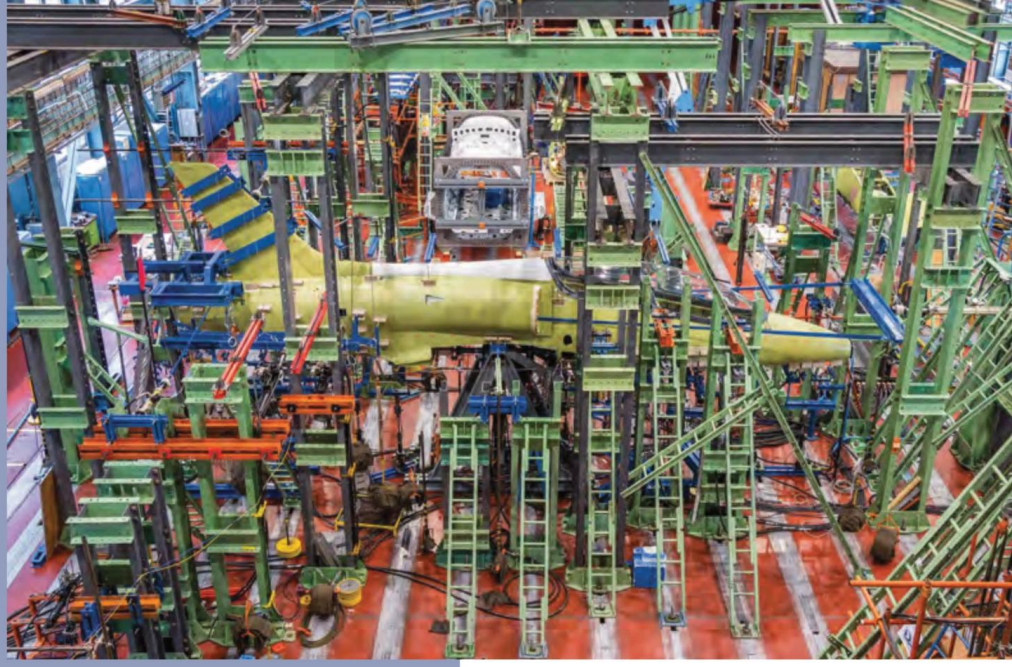
The Penta Group, which owned Aero Vodochody for 13 years, sold the business on June 11 to Hungarian registered Aero Investment Partners. The joint venture comprises Hungarian businessman and former national security advisor, András Tombor, who owns 51%, and Czech company Aero International (part of the Omnipol Group), which owns the remaining 49%.

During the Cold War era, Omnipol Group was responsible for exporting almost all its aircraft from the Aero Vodochody production lines. Since 2015, the company has been a strategic partner in the L-39NG programme.



First flight of the prototype, 7001 (wearing Czech military serial 0475), took place on December 22, 2018 Aero

Left: In June, the second L-39NG prototype, 7002, completed static testing at the Czech Aerospace Research Centre (VZLU) *Aero*
Below: VZLU now has the third prototype, 7003, going through up to 25,000 hours of fatigue testing – five times the 5,000-hour life of the airframe *Aero*



Aero Vodochody to ensure the aircraft is a success." Nearly two years on, the company has still not ordered the aircraft.

On December 22, 2018, Aero test pilots David Jahoda and Vladimír Továrek flew the aircraft on its first flight. The jet took off at 10.38am, climbed up to 1,525m and returned after 26 minutes. David Jahoda said after the flight: "The L-39NG performed extremely well and met our expectations. All installed systems worked perfectly, and cockpit visibility was excellent."

Unlike the fanfare of the roll out, the first flight was made with minimum fuss. The aircraft flew in a serial production configuration with upgraded wet wings and air inlets. The goal then was to achieve certification by the end of 2019, but that was delayed because 7001 was laid up for nearly a year going through further modifications. It did not fly again until September 2019 when it appeared at NATO Days airshow in Ostrava, eastern Czech Republic.

Flutter trials and system-checks were among the first few flights, with the certification process set to encompass both the trainer and advanced trainer versions.

Aero Vodochody president and CEO, Dieter John, recently told *AFM*: "We opted to go straight for the advanced trainer version because we see significantly more business there than the basic trainer, and we wanted to speed up the certification process. If the customer wants the latter, the certification covers that anyway."

Details of the flight-test programme were revealed at Ostrava, which showed 7001 being reconfigured into a light attack version between June and August 2020. This would leave the second flight test vehicle, 7004, to concentrate on the advanced jet trainer certification.

The second L-39NG (and first pre-series aircraft), 7004, flew on December 9, 2019 with company pilots Vladimír Továrek and Vytautas Požela at the controls. Požela, an ex-Lithuanian Air Force pilot, had joined the company a few months earlier.

The Russian question

While there are no plans to sell to Russia, interest remains high from Eastern European countries wanting eastern weapons, like the Vympel R-73 (AA-11 Archer) instead of the AIM-9L Sidewinder.

"Unfortunately, there is a lot of trouble licensing Russian weapons," Jaromir Lang said. "We have to decide whether we want to work with a Russian avionics system or continue with IAI to extend the VTS capability. The CzAF still use Russian unguided rockets and bombs... Currently, 7001 and 7004 are both being used for trainer certification, so the light-attack reconfiguration will start afterwards."

While 7001 currently flies in a non-standard colour scheme, 7004 remains in primer. The original plan was to sell 7004 to the first customer, but now, as a pre-series aircraft, Aero plans to keep it and repaint it after the L-39NG trainer is certified this month.

While 7001 and 7004 both play their part in the L-39NG flight test programme, two other prototypes, 7002 and 7003, are used for ground tests to meet the certification requirements.

The prototypes

Aircraft	Role
MSN 7001 L-39NG	Prototype flight tests, ground vibration tests, weapon tests
MSN 7002 L-39NG	Static test
MSN 7003 L-39NG	Fatigue test
MSN 7004 L-39NG	Pre-series aircraft, will assist with weapons testing
2626 L-39CW	New technologies demonstrator

Ground testing

As 7001 was being put through the test programme and ground vibration tests, the second prototype, 7002, was transported to the Czech Aerospace Research Centre (VZLU) in mid-2019. The aircraft was used for static tests to verify airframe strength to comply with European Military Airworthiness Certification Criteria (EMACC) requirements. In March, the fuselage was intentionally tested with excessive loads, leading to a structural failure at 110%. With this success, testing eventually ended in June.

To meet the 5,000 flight-hour service life, fatigue testing on aircraft 7003 commenced at VZLU in May 2020. CEO Dieter John said of the tests: "Depending on how the aircraft is used and the loads on the structure during flights, the estimated life of the L-39NG could be up to 15,000 hours, which is significantly higher than the lifespan of the L-39 Albatros."

Like 7002, the airframe was placed in a test rig to simulate operations of the aircraft through the controlled loading of individual parts on the aircraft. The testing will simulate take-offs and landings, flight itself, and with underwing weapons.

John is adamant certification will be completed this month: "I get test reports every day and look over the plans for the next 24 hours," he explained. "In addition to the ground tests at VZLU, we are working at quite a pace – flying six days a week and sometimes up to four times a day. We closed the flutter campaign in March, the air-inlet distortion campaign in April, the loads testing in mid-May and the Williams FJ-44M engine campaign began on May 12." He then added: "I don't want to lose a single day before September." AFM

L-39NG 7004 shares an air data boom with stable-mate 7001. The pre-series aircraft is seen here during inlet distortion testing in April *Alan Warnes*

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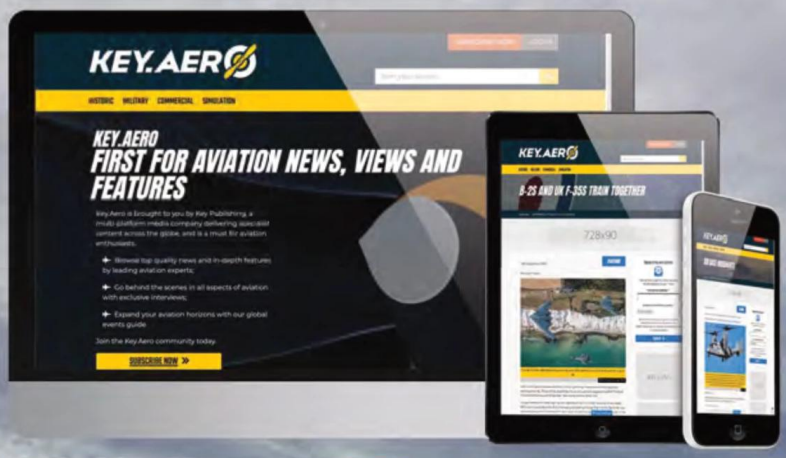

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